THREE ESSAYS ON THE EFFECT OF INFORMATION ON PRODUCT VALUATION

A Thesis

by

ROBERT GEORGE BRUMMETT

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

December 2006

Major Subject: Agricultural Economics

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Approved by:

Chair of Committee, Rodolfo M. Nayga, Jr.
Committee Members, Ximing Wu
Brit Grosskopf
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ABSTRACT

Three Essays on the Effect of Information on Product Valuation. (December 2006)

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Benefits and consequences of controversial products are debated in the public arena for the protection of consumers and to evaluate the market decisions made by industry and government. The food industry continues to develop new foods as well as processes to bring food to the market. Some of these processes bring to issue the safety of the products or the impact on the market, workers, or environment. Such controversial products or processes include BSE (mad cow disease), genetically modified organisms (GMO), antibiotics, pesticides, carbon monoxide modified atmosphere packaging, and food irradiation.

This thesis sets out with the objective of understanding, developing, and utilizing methodologies similar to those used in other contingent valuation studies to evaluate how consumers are influenced by varying information using food irradiation as a focus subject. Food irradiation is a technological food process that continues to be debated and much information favoring and opposing it is readily available to the public, making it a suitable subject about which to study information effects and consumer acceptance.

To accomplish this objective, consumers were surveyed in grocery stores in the state of Texas during the spring of 2006. As irradiated foods are not currently widely

available, a hypothetical product, irradiated mangoes, was used to elicit information from survey participants. The survey was comprised of two parts. First general information regarding consumer knowledge and trust of food irradiation as well as willingness to pay (WTP) was collected. Second, varying information regarding food irradiation (positive, negative, or mixed) was presented and questioning was reaccomplished.

Evaluation of the survey data was made in three papers, each comprising its own chapter in this thesis. The first paper evaluates consumers' initial trust and knowledge of food irradiation and how these factors interact with information in changing WTP. The second paper assesses responses for a "cheap talk" effect. Cheap talk is informing consumers of the existence of hypothetical bias in studies of this type with the goal being to reduce this bias to real life response equivalence. The third paper evaluates not only WTP, but also how consumer trust is affected by varying forms of information.

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I also owe gratitude to the faculty and staff of the Department of Agricultural Economics. Drs. Eluned Jones, Yanhong Jin, and Levan Elbakidze have always been available for advice and discussion.

My appreciation goes to the H.E. Butt Grocery Company for allowing me conduct surveys in their stores, providing coupons for survey participants, and their assistance with survey forms.

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CHAPTER I

INTRODUCTION

New products are continually being introduced to the market which may involve processes or origins important to consumers. The objective of this thesis is to evaluate the impact of differing information types (positive, negative, or mixed) on consumer attitudes toward, and perceptions of products where market data is not readily available, using an irradiated food as a target product.

Food irradiation continues to be a controversial topic, and using it as a target product elicits varying degrees of acceptance and product perceptions that are broad enough in scope to evaluate acceptance of the product and the effects of information on that acceptance from a variety of consumers with differing attitudes and perceptions. Willingness to pay (WTP) is evaluated by comparing pre-information presentation WTP to post-information presentation WTP. Additionally, consumer perceptions, knowledge, and trust regarding food irradiation are evaluated by incorporating these variables into the WTP analysis.

This thesis is comprised of three different, yet related papers evaluating intrinsic variables held by consumers and employed in the literature. Each paper comprises its own chapter, with a summary and conclusion for the thesis to follow in the final chapter. The first two papers are methodological in nature and provide insight about the interaction of trust, knowledge, and information, including cheap talk. The objective of

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This thesis follows the style and format of the *Journal of Consumer Research*.

the third paper is to provide a more robust analysis of information on consumer WTP and acceptance of irradiated foods by building on the findings of the first two.

The first paper evaluates how consumers' prior trust and knowledge interact with, and are affected by, varying types of food irradiation information (positive, negative, and mixed). This study investigates the effect of information on consumers' product valuation as measured by willingness to pay. Additionally, this study is designed to identify if an order effect in information presentation exists when both types of information are presented together, but in differing order. Results are observed that measure the information effects and provide insight useful to industry, academia, and regulatory agencies on the influence of information on consumer attitudes and perceptions. Consumers' WTP for an irradiated fruit before and after information regarding food irradiation is presented. The participants were randomly assigned into one of three treatment groups: positive information, negative information and mixed information. When mixed information is presented, the order effect (positive-then-negative vs. negative-then-positive) is also examined. Results of consumer prior knowledge and trust regarding food irradiation generally suggest that positive information has little effect on the WTP, and negative information, whether presented alone or with positive information, significantly decreases the WTP. Order effects are not detected. Consumers' prior knowledge and trust of the product are not observed to mitigate the information effects on WTP. The WTP of subjects lacking prior knowledge, compared to those with prior knowledge, are more heavily influenced by information

presented. The average WTP of subjects decreased after presentation of negative information and is lower for those without trust than those with trust of the product.

The second paper evaluates the effects of information referred to as “cheap-talk”. Essentially, since a hypothetical product (irradiated mangoes) is being presented as an option to consumers in eliciting WTP, study participants were informed that previous studies asking WTP on a hypothetical product show that respondents tend to overestimate their choice. This provided information to help address questions regarding error in using a hypothetical situation as well as provide another information attribute to be evaluated in consumer studies of this type. Results generally suggest that willingness to pay values, with and without cheap talk, are not statistically different in the majority of the sample. Some cheap talk effects were observed however, among those who trust the product in one of the treatments. Cheap talk was found to have a mitigating effect on the influence of the treatment and control variables on willingness to pay.

The third paper builds on the previous two and information effects on WTP are also evaluated with respect the level of trust in food irradiation. Results generally suggest that positive information increases WTP but more so for those without initial trust of food irradiation while negative information, whether presented with positive information or alone, reduces WTP but only for those with initial trust. The results also suggest that those with initial trust in food irradiation generally have higher WTP pre- and post-information than those who do not have initial trust. Positive information increases trust while negative information, again whether presented with positive information or alone, decreases trust. Hence, negative information dominates positive

information and decreases both trust and WTP. The fifth chapter summarizes the results of this thesis, and offers suggestions for future research.

The design of the surveys in our study incorporated both positive and negative information from varying sources. The information presented to participants was excerpted from government and consumer advocacy organizations websites. We balanced the information on a point and counter point basis, without modifying the content excerpted from the sources. Our results generally indicate that the negative information outweigh the positive even with this balancing, which is consistent with Hayes, Fox, and Shogren (2002).

We conducted our surveys in four different Texas cities (Houston, Austin, San Antonio, and Waco). With the help of the grocery retailer allowing us to conduct surveys in their stores, we selected stores with customers from varying demographic backgrounds.

CHAPTER II

INFORMATION EFFECTS ON PRODUCT VALUATION: DO PRIOR KNOWLEDGE AND TRUST MATTER?

Introduction

In this study, we investigate the effect of information on consumers' willingness to pay for a product. The existing studies have shown that positive and negative information about a product can have differential effects on product acceptance. Positive information, when presented alone, has been demonstrated to increase product acceptance (Hayes et al 2002; Nayga, Aiew, and Nichols 2005). On the other hand, the literature, especially the impression formation literature, found that negative information effects far outweigh positive information effects (e.g., Klein 1996; Kroloff 1988; Skowronski and Carlston 1989; Wright 1974). For example, it has been shown that negative attributes generally have a stronger influence on consumers' judgments on product quality than positive attributes (Fiske 1980). Similarly, negative personality traits have been shown to have a greater influence on interpersonal judgments (Skowronski and Carlston 1987) and negative word of mouth has been shown to have a stronger impact than positive word of mouth (Herr, Kardes, and Kim 1991). Negative information, whether presented alone or in combination with positive information has also been shown to decrease product acceptance (Hayes, Fox, and Shogren 2002).

Maheswaran and Meyers-Levy (1990) noted that one reason for the negativity effect is that negative information is considered more diagnostic or informative than

positive information. Prospect theory also posits that people tend to become more risk seeking in the domain of losses than gains (Kahneman and Tversky 1979). Although it is suggested that consumers respond to negative information in a homogenous manner (Marconi 1997; Pearson and Mitroff 1993), Ahluwalia, Burnkrant, and Unnava (2000) argued, however, that prior characteristics of the consumer could moderate the processing and impact of negative information. Specifically, they evaluated the specific effect of commitment to a target brand and tested the differential responses to negative information of consumers who are high and low in commitment. They found that commitment is a moderating factor of negative information effects.

When faced with a choice, consumers also rely on a number of other factors, in addition to commitment to a brand, in the decision making process. This holds true for a variety of goods and services and the factors at work behind these decisions are complex. External influences on the attitudes and perceptions held by consumers regarding a particular product weigh in on the choices made by consumers. Two of these key variables that influence attitudes and perceptions toward a product are prior knowledge and initial trust of the product. We contend that these two factors form initial beliefs that could mitigate or distort new information and subsequently influence how information is processed in the valuation of a product. For example, it is well known that people tend to perceive new information as compatible with their prior beliefs (Hoch and Ha 1986). The mechanism for these initial beliefs is similar to that associated with a confirmatory bias or sticky prior beliefs (Bolton 2003; Jonas et al. 2001; Klayman 1995;

Schwenk 1986) and Biyalogorsky, Boulding, and Staelin (2006) refer to this path as "belief inertia distortion".

Consequently, in this study, we argue that effects of information, be it positive or negative, can differ depending upon consumers' initial beliefs based on prior trust and knowledge of a product. We hypothesize that information effects on consumer response are influenced by the initial values of these two variables. Prior knowledge has been shown to reduce acceptance of a product by a greater factor than was discounted by those without prior knowledge, and consumers with no prior knowledge of the product attribute are more heavily influenced by the presentation of information than those that possess prior knowledge (Huffman et al. 2006). Hence, exploration of the influence of prior trust and knowledge has the potential to further the understanding of the effects of information on product acceptance or valuation.

Our study differs from most other studies in several respects. First, we attempt to assess the individual and combined effects of positive and negative information on consumer valuation of a product. Second, since the order in which the consumer receives information may affect the impact of the message (Crowley and Hoyer 1994) and product valuation, we assess the possible existence of order effects in the presentation of information. Hass and Linder (1972) provided some evidence that negative information presented early in a message is more effective for persuasion than placing it last or not mentioning it at all. Third, we analyze the differential responses to information by consumers grouped based on their level of prior knowledge and trust of the product[1]. To

[1] During the conduct of this study, irradiated mangoes were not sold yet in supermarkets.

the best of our knowledge, this is the first study to investigate if and how information effects on product valuation varies by level of prior knowledge and initial trust of the product. Fourth, we use a field experiment with a diverse set of participants rather than using students in a laboratory study, which hopefully helps with the generalization of the findings. Fifth, we use as a case product a relatively novel product in irradiated mangoes. Due to the controversy surrounding food irradiation technology, the use of irradiated mangoes provides an excellent opportunity to test the role of initial beliefs, as formed through prior knowledge and trust of food irradiation, on information effects and product valuation. It has been shown that a novel attribute can affect product evaluation (Mukherjee and Hoyer 2001). Sixth, instead of a simpler new product evaluation measure based on product acceptance, we use an economic and quantitative measure in willingness to pay (WTP). To cope with an increasingly demand-driven marketplace, many businesses are interested in "adding value" to their products by differentiating or developing alternative products or services with new technologies. Hence, estimates of the value of novel products are becoming important instruments guiding decision-making. However, research and development and new product introductions can be costly, especially in very competitive markets with low success rates (e.g., food industry). Thus, research on consumers' WTP for these novel goods or services is critical to product introduction or adoption decisions.

Our results suggest that positive information has little effect on the WTP, and negative information, whether presented alone or with positive information, significantly decreases the WTP. However, WTP of those given positive information is higher than

WTP of those given negative information or those given both positive and negative information. Order effects are not evident. Prior trust and knowledge are generally shown not to mitigate the effects of information on product valuation. The rest of the paper is structured as follows: the next section lays out the study design. The third section discusses the survey results and presents hypothesis tests regarding information effects. Concluding remarks are given in the last section.

Study Design

In this section, we discuss the design and implementation of our field experiment. We then use a novel method to calculate the WTP of the participants, which is not restricted by the implicit bounds imposed by the elicitation mechanism we used (i.e., payment card).

Theoretical Motivation

Theoretical frameworks have been postulated that help explain the mechanisms at work in information effects. Crowley and Hoyer (1994) evaluated previous theories in their study on two-sided persuasion, which consists of a message that provides information about both positive and negative attributes of a product. One of the theories they discussed is Inoculation Theory where the form of the message being presented is strengthened by identifying weakness in the product then refuting these identified weaknesses in the same material presentation (McGuire 1961). They also identified Attribution Theory (Kelley 1973) as the process where cause is assigned to events.

Under this theory, the inclusion of negative information along with positive information is made, but not refuted. The inclusion of negative information is expected to increase acceptance of the product because the consumer may infer trust in the message if the advertiser is willing to present both the positive and negative attributes. Optimal Arousal Theory (Berlyne 1971), on the other hand, argues that a novelty factor increases acceptance of a product. However, the magnitude of the novelty may have adverse consequences in that too much of it could lead to a negative effect (i.e., reduced acceptance). Essentially, this theory suggests that negative information may be useful or detrimental in generating favorable attitudes toward a product, depending on its use, context, and volume.

When prior knowledge is not held, however, the presentation of conflicting information may lead to decreased acceptance. This can be attributed to people's inability to reconcile the inconsistent information when lacking prior knowledge or information (Sengupta and Johar 2002). It has also been suggested that prior positive values held by consumers may mediate the effects of negative information (Ahluwalia, Burnkrant, and Onnava 2000). However, large amounts of negative information, when presented with positive information, may outweigh the positive information and result in a net negative effect (Crowley and Hoyer 1994).

Building on these theories and previous studies, this paper aims to further the understanding of information effects through a carefully designed and implemented field experiment. In our experiments and subsequent analysis, we not only consider positive, negative and mixed information, but also the possible mitigating effects of initial trust

and prior knowledge. In addition, we investigate the order effect in the presentation of both types of information since the order in which the consumers receive and process information may affect the impact of the message (Crowley and Hoyer 1994).

Field Experiment

We use an arte-factual field experiment (see Harrison and List 2004) to assess the effect of positive and negative information on product valuation and to examine the influence of prior knowledge and trust on information effects. Specifically, we recruited participants in the field (i.e., grocery stores). Grocery shoppers in different cities in Texas were asked during spring 2006 to participate in surveys regarding their willingness to pay for irradiated mangoes. Participants were provided a brief information sheet about mangoes and were informed that prior to entering the country, mangoes must be treated to eliminate insects, which may be harmful to domestic crops if imported. They were informed that we were evaluating their perceptions of, and attitudes toward food irradiation, an alternative to conventional processes to eliminate insects. They were informed that food irradiation kills or sterilizes insects and utilizes energy versus more conventional insect control processes.

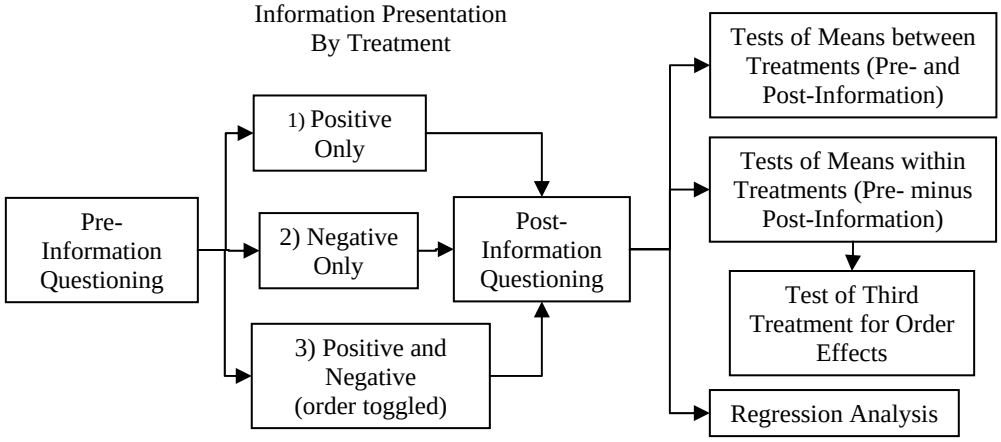
Participants were then asked a series of questions to identify their shopping habits as well as knowledge and perceptions of food irradiation prior to the presentation of information regarding food irradiation. Additionally, prior to information presentation, participants were informed of the average price for mangoes in the past year ($0.50 each) and were then asked their WTP for an irradiated mango. WTP choices

were provided in the form of a payment card. In a payment card, participants are presented with a range of monetary amounts and are asked to identify the maximum amount they would be willing to pay. The categorical values used in the payment card were determined based on the pre-tests and were calculated using the method described in Rowe, Schulze, and Breffle (1996). The values ranged from $0.00 to $0.50 and included a response for “more than $0.50”. Marginal WTP (i.e., willingness to pay extra compared to non-irradiated mango) was utilized instead of a WTP unit price as this allows participants to better “picture” the extra expenditure on food if paying more for the irradiated product (De Ridder and De Graeve 2005).

More specific information was then presented to the participants. Participants were randomly assigned to different treatments (see Figure 2.1). Treatments were differentiated by type of information to be presented. In the first treatment, participants were provided positive information stating the benefits of food irradiation. In the second treatment, participants were provided negative information regarding negative consequences of food irradiation. In the third treatment, participants were provided both forms of information, though the order of the information was alternated between positive-then-negative and negative-then-positive. After the presentation of the information, participants were again asked about their attitudes and perceptions toward food irradiation, including WTP utilizing the payment card method described above. The positive and negative information used in the study are exhibited in Appendix A and B.

Figure 2.1

Experiment Structure and Analysis



Payment Card Calculation

Based on the pre-tests, we offered choices within the range of 0-50 cents. Therefore, participants with marginal WTP equal to or less than zero are reported to have a zero (lowest category) WTP. On the other hand, people with WTP greater than 50 cents (highest category) are reported with a non-numerical value ("greater than 50 cents"). If we simply use zero and 50 cents as their WTP for these lowest and highest categories, our statistical analysis may suffer from measurement errors.

Instead, we use an alternative method. Under the assumption that the underlying WTP distribution is sufficiently smooth, we estimate the entire WTP distribution based on the discrete information obtained from our payment card report. Wu and Perloff (forthcoming) propose a density estimator from grouped data using the maximum entropy density method. By matching the population and sample moments for each WTP

interval, this estimator is able to obtain an accurate approximation of the underlying distribution. The density function has a flexible functional form

$$f(x) = \exp(-\sum_{i=0}^{K} \lambda_i x^i) .$$

It is known that this maximum entropy density nests many commonly used distributions. With *K = 2*, it coincides with the normal distribution. When *K = 4*, this density is able to accommodate skew and/or fat-tailed distribution, or even multi-modal distribution. Moreover, the support of the unknown distribution is allowed to be the real line. This extra degree of freedom is particularly useful for our purpose, as we are interested in the truncated mean of WTP for people reporting zero or greater than 50 cents WTP.

For our estimation, we set *K = 4*, and estimate the underlying WTP distribution for each treatment scenario before and after treatment. With the estimated density, we evaluate the truncated average WTP for people reporting zero and greater than 50 cents WTP. The minimum and maximum WTP values are reported in Table 2.1. Note that although we allow the support of the density to be the real line, the estimates suggest that the underlying distribution is likely to range from -$0.10 to $0.65.

Analysis of Experiment Results

Information Effect Hypotheses

The design of our experiment allows us to investigate the possibly differential effects of positive, negative and mixed information. We developed a list of hypotheses based on prior studies and the objective of our study:

H1: Positive information presented alone increases the WTP.

H2: Negative information presented alone decreases the WTP.

H3: When both forms of information are presented, the negative information dominates, and the net effect decreases the WTP.

H4: When both forms of information are presented, there is an order effect such that the order of presentation (positive-then-negative vs. negative-then-positive) influences the net effect of information.

H5: Information effects on the WTP depend on the initial levels of knowledge and trust of the product.

In all, 155 participants completed surveys used in the experiments. The breakdown of participants by treatment and summary statistics of the WTP are presented in Table 2.1. Table 2.2 reports the t-tests on the difference in the average pre-information WTP between different treatment groups. The results suggest that there is no systematic difference in the average WTP for participants in different treatment group, which is consistent with the randomness of treatment assignment of our experiment.

Table 2.1

Summary of Willingness to Pay Means by Treatment

Treatment	n	Pre/Post Information	Mean	SD	Difference in Means (Post – Pre)	Within Treatment Test of Means *p*-value
Positive only	49	Pre	.1448	.2201	.0190	.143
		Post	.1638	.2066		
Negative only	55	Pre	.1268	.2393	-.1086	.000**
		Post	.0182	.1806		
Positive and Negative	51	Pre	.0805	.2099	-.0545	.041**
		Post	.0260	.1769		
Below is the third treatment split by order of information presentation.						
Positive then Negative	24	Pre	.0761	.2212	-.0702	.067*
		Post	.0060	.1419		
Negative then Positive	27	Pre	.0844	.2036	-.0406	.288
		Post	.0439	.2042		

*significant at the .10 level
**significant at the .05 level

Table 2.2

Tests of Willingness to Pay Means between Treatments

		Pre-Information		Post-Information	
Treatment	n	Difference	*p*-value	Difference	*p*-value
Positive only – Negative only	49 / 55	.0180	.691	.1456**	.000
Positive only – Positive and Negative	49 / 51	.0643	.139	.1378**	.001
Negative only – Positive and Negative	55 / 51	.0462	.291	-.0078	.822
Below is the third treatment split by order of information presentation.					
Positive only – Positive then Negative	49 / 24	.0687	.219	.1578**	.000
Positive only – Negative then Positive	49 / 27	.0604	.235	.1199**	.018
Negative only – Positive then Negative	55 / 24	.0507	.366	.0122	.748
Negative only – Negative then Positive	55 / 27	.0424	.407	-.0257	.582
Positive then Negative – Negative then Positive	24 / 27	-.0083	.890	.0379	.442

**significant at the .05 level

It is hypothesized that the presentation of positive information would result in an increased WTP, indicating an increased value in the irradiated mangoes being perceived by participants and a greater acceptance of irradiated foods. In treatment one where only positive information is presented, the pre-information mean WTP was $0.1448, and the post-information mean was $0.1638 (Table 2.1). The t-tests of difference in means indicate that the increase was not statistically significant (p = .143). Although this test does not support a definitive effect between the presentation of positive information and increased WTP, neither does it show an adverse or unexpected result (i.e., a significant decrease). Further analysis of this treatment will be subsequently explained that may shed more light on this subject.

A second hypothesis is that the presentation of negative information will decrease the mean WTP. The pre-information WTP for this treatment was $0.1268 versus $0.0182 post-information (Table 2.1). The t-tests indicate a highly significant information effect (p = .000), lending strong support to the hypothesis that negative information decreases the WTP.

Hypothesis three postulates that negative information dominates positive information and the net effect decreases WTP in the third treatment where mixed information is presented. Pre- and post-information mean WTP was $0.0805 and $0.0260, respectively (Table 2.1). The t-tests verify that the WTP decreased significantly following the presentation of mixed information (p = .041), indicating that the negative information, though presented with the positive information, does decrease WTP.

We divide the third treatment group into two subgroups according to whether the positive or negative information was presented first. The t-tests of the mean WTPs of these sub-treatments suggest that when positive information was presented first, the mean WTP indeed decreased (p = .067). The significance level of these results is marginally less than that seen in the previously described tests. Further, when negative information was presented first, no significant difference was observed (p = .288). These results suggest that there are no strong order effects.

Effects of Prior Knowledge and Trust

Overall, regarding the information effects, the results support our hypotheses 2 and 3, but not 1 and 4. Further analyses into the variables that factor into the consumer decision making process, specifically prior knowledge and trust of irradiated foods, might help better understand and explain the role of these factors in explaining the interaction of the factors with varying types of information on consumer valuation of irradiated foods.

Prior knowledge was identified in the survey by asking participants to rate their knowledge as: adequately informed about the irradiation, somewhat informed, heard of food irradiation but know nothing about it, and have not heard of food irradiation. For simplicity, we classify those individuals that were somewhat to adequately informed as knowledgeable, and those that stated they had not heard of, or knew nothing about food irradiation as not knowledgeable.

Initial trust in food irradiation was determined by posing the question, “Would you trust irradiated food products?” to participants prior to the presentation of information. The response was a dichotomous variable “Yes” or “No”.

To further evaluate the mechanisms at work behind the effects of information on WTP and the underlying changes in attitude and perception, we utilized the same data set from the experiments in our overall analysis and incorporated the prior knowledge and initial trust of food irradiation held by participants. As discussed above, we did not observe the expected increase in WTP resulting from the presentation of positive information for participants in treatment 1 when we did not consider initial trust or knowledge. However, among participants with no prior food irradiation knowledge, we observe an increased WTP. Mean WTP increased from \$0.1326 to \$0.1635 (p = .044 (Table 2.3)). A significant change in WTP among the participants with prior knowledge was not observed and the mean WTP remained essentially unchanged (\$0.1699 pre- and \$0.1644 post-information). Interestingly, the information effect expressed a greater ability to positively influence those lacking knowledge, while those possessing prior knowledge were not swayed. This is consistent with the findings of Huffman et al. (2006).

Assessment of the trust factor shows that among those that expressed an initial non-trust of irradiated foods, the positive information was marginally effective in increasing WTP. Mean WTP went from -\$0.0065 to \$0.0205 (p = .065, Table 2.4). The WTP among those possessing an initial trust was unchanged. As expected, the WTP

among those with trust was much higher than those without trust ($0.2116 pre-, $0.2270 post-information).

Although we are able to see influences of the individual results of the trust and knowledge factors on WTP resulting from positive information, our analysis of the effect when these factors were coupled failed to identify any significant positive information effect (Table 2.5). In summary, we note that the information presented in this experiment (positive only) was only marginally effective in increasing WTP among those without trust and that increase remained at the lower end of the payment card choices as compared higher WTP responses among those with trust. Participants without prior knowledge, evaluated independent of trust, did appear to be positively influenced by the information. However, we could not maintain support of this hypothesis when these factors were combined. This is congruent with our analysis of the overall information effects, prior to evaluation of the trust and knowledge factors within the treatment.

Table 2.3

Summary of Willingness to Pay Means by Treatment and Knowledge

Treatment	n	Pre/Post Information	Mean	SD	Within Treatment Test of Means *p*-value
No Knowledge					
Positive only	33	Pre	.1326	.2013	.044**
		Post	.1635	.1870	
		Difference (Post – Pre)	.0308		
Negative only	41	Pre	.1514	.2667	.001**
		Post	.0262	.2030	
		Difference (Post – Pre)	-.1252		
Positive and Negative	36	Pre	.1133	.2183	.057*
		Post	.0444	.1797	
		Difference (Post – Pre)	-.0689		
	Below is the third treatment split by order of information.				
Positive then Negative	16	Pre	.1307	.2423	.162
		Post	.0554	.1486	
		Difference (Post – Pre)	-.0754		
Negative then Positive	20	Pre	.0993	.2024	.207
		Post	.0356	.2046	
		Difference (Post – Pre)	-.0638		
Knowledgeable					
Positive only	16	Pre	.1699	.2603	.821
		Post	.1644	.2489	
		Difference (Post – Pre)	-.0055		
Negative only	14	Pre	.0548	.1074	.061*
		Post	-.0054	.0893	
		Difference (Post – Pre)	-.0602		
Positive and Negative	15	Pre	.0019	.1700	.488
		Post	-.0180	.1678	
		Difference (Post – Pre)	-.0199		
	Below is the third treatment split by order of information.				
Positive then Negative	8	Pre	-.0331	.1206	.205
		Post	-.0929	.0456	
		Difference (Post – Pre)	-.0598		
Negative then Positive	7	Pre	.0419	.2168	.408
		Post	.0676	.2174	
		Difference (Post – Pre)	.0256		

*significant at the .10 level
**significant at the .05 level

Table 2.4

Summary of Willingness to Pay Means by Treatment and Trust

Treatment	n	Pre/Post Information	Mean	SD	Within Treatment Test of Means *p*-value
No Trust					
Positive only	15	Pre	-.0065	.0964	.065*
		Post	.0205	.0947	
		Difference (Post – Pre)	.0270		
Negative only	18	Pre	.0919	.2566	.045**
		Post	-.0067	.1937	
		Difference (Post – Pre)	-.0986		
Positive and Negative	22	Pre	.0188	.1907	.476
		Post	-.0130	.1672	
		Difference (Post – Pre)	-.0318		
Below is the third treatment split by order of information presentation.					
Positive then Negative	10	Pre	-.0313	.1307	.833
		Post	-.0363	.1202	
		Difference (Post – Pre)	-.0050		
Negative then Positive	12	Pre	.0605	.2265	.507
		Post	.0650	.2016	
		Difference (Post – Pre)	.0045		
Trust					
Positive only	34	Pre	.2116	.2271	.384
		Post	.2270	.2117	
		Difference (Post – Pre)	.0154		
Negative only	37	Pre	.1438	.2322	.002**
		Post	.0274	.1759	
		Difference (Post – Pre)	-.1164		
Positive and Negative	29	Pre	.1274	.2148	.032**
		Post	.0556	.1812	
		Difference (Post – Pre)	-.0715		
Below is the third treatment split by order of information presentation.					
Positive then Negative	14	Pre	.1529	.2440	.066*
		Post	.0361	.1525	
		Difference (Post – Pre)	-.1167		
Negative then Positive	15	Pre	.1036	.1892	.294
		Post	.0737	.2083	
		Difference (Post – Pre)	-.0298		

*significant at the .10 level
**significant at the .05 level

Table 2.5

Summary of Willingness to Pay Means by Treatment, Trust, and Knowledge

Treatment	n	Pre/Post Information	Mean	SD	Within Treatment Test of Means *p*-value
No Trust, No Knowledge					
Positive only	10	Pre	.0037	.1089	.146
		Post	.0324	.1053	
		Difference (Post – Pre)	.0287		
Negative only	16	Pre	.0983	.2662	.039**
		Post	-.0082	.1984	
		Difference (Post – Pre)	-.1065		
Positive and Negative	15	Pre	.0691	.2145	.574
		Post	.0319	.1875	
		Difference (Post – Pre)	-.0372		
Below is the third treatment split by order of information presentation.					
Positive then Negative	6	Pre	.0073	.1621	.906
		Post	.0122	.1377	
		Difference (Post – Pre)	.0049		
Negative then Positive	9	Pre	.1104	.2436	.556
		Post	.0450	.2218	
		Difference (Post – Pre)	-.0654		
No Trust, Knowledgeable					
Positive only	5	Pre	-.0271	.0711	.323
		Post	-.0032	.0735	
		Difference (Post – Pre)	.0239		
Negative only	2	Pre	.0412	.2246	.500
		Post	.0596	.1986	
		Difference (Post – Pre)	.0184		
Positive and Negative	7	Pre	-.0891	.0000	-
		Post	-.1090	.0000	
		Difference (Post – Pre)	-.0199		
Below is the third treatment split by order of information presentation					
Positive then Negative	4	Pre	-.0891	.0000	-
		Post	-.1090	.0000	
		Difference (Post – Pre)	-.0199		
Negative then Positive	3	Pre	-.0891	.0000	-
		Post	-.1090	.0000	
		Difference (Post – Pre)	-.0199		

**significant at the .05 level

- blanks indicate insufficient data to test means

Table 2.5 (continued)

Treatment	n	Pre/Post Information	Mean	SD	Within Treatment Test of Means *p*-value
Trust, No Knowledge					
Positive only	23	Pre	.1886	.2080	
		Post	.2205	.1873	.124
		Difference (Post – Pre)	.0319		
Negative only	25	Pre	.1854	.2668	
		Post	.0483	.2068	.011**
		Difference (Post – Pre)	-.1371		
Positive and Negative	21	Pre	.1448	.2206	
		Post	.0533	.1780	.029**
		Difference (Post – Pre)	-.0915		
Below is the third treatment split by order of information presentation					
Positive then Negative	10	Pre	.2048	.2588	
		Post	.0813	.1558	.139
		Difference (Post – Pre)	-.1235		
Negative then Positive	11	Pre	.0902	.1737	
		Post	.0278	.2001	.053*
		Difference (Post – Pre)	-.0624		
Trust, Knowledgeable					
Positive only	11	Pre	.2595	.2671	
		Post	.2406	.2652	.585
		Difference (Post – Pre)	-.0189		
Negative only	12	Pre	.0571	.0949	
		Post	-.0162	.0703	.047**
		Difference (Post – Pre)	-.0733		
Positive and Negative	8	Pre	.0816	.2056	
		Post	.0616	.2020	.724
		Difference (Post – Pre)	-.0200		
Below is the third treatment split by order of information presentation					
Positive then Negative	4	Pre	.2295	.1599	
		Post	-.0768	.0645	.333
		Difference (Post – Pre)	-.3063		
Negative then Positive	4	Pre	.1402	.2528	
		Post	.2000	.2000	.273
		Difference (Post – Pre)	.0598		

*significant at the .05 level
**significant at the .05 level

When only negative information is presented, our results show that consumers with no prior knowledge significantly decreased their WTP for irradiated foods. Mean WTP decreased from $0.1514 to $0.0262 ($p$ = .001, Table 2.3). Though marginally less significant (p = .061), the WTP decreased as well among consumers with prior knowledge. These results support our hypothesis that negative information will decrease product valuation. As observed in experiment one, individuals lacking prior knowledge of food irradiation were more heavily influenced by the information presented.

With respect to trust, we see that the presentation of negative information does decrease the WTP. Mean WTP decreased from $0.0919 to -$0.0067 among participants without trust and from $0.1438 to $0.0274 among those with prior trust (p = .045 pre- and p = .002 post-information, Table 2.4). We note that those with trust maintain a positive, though significantly reduced WTP, while those without trust essentially indicate they would not be willing to pay any additional amount after being presented negative information. This indicates that prior trust may be a mitigating factor in the effect of negative information on WTP.

Evaluation of the coupling of these factors and the presentation of negative information further supports our hypothesis of WTP reduction resulting from the presentation of negative information. Reduction in WTP regardless of prior trust and knowledge is seen in the test results of WTP means (Table 2.5). We note, however, that this analysis, where consumers did not have trust but did have prior knowledge, consisted of only two participants (Table 2.5). This sub-group within the treatment is too small to provide a reliable assessment. However, looking back at the results with respect

to the prior trust and knowledge factors, we see that negative information would indeed decrease the WTP, especially considering the significant reduction observed among those lacking trust.

The third treatment involved presenting both forms of information utilized in experiments 1 and 2. The order of the information was changed between presenting the positive information first and the negative information first.

When the order effect is not considered, participants with no knowledge were marginally influenced by the information while those that possessed prior knowledge did not change their WTP. The mean WTP among those without knowledge decreased from \$0.1133 to \$0.0444 (p = .057, Table 2.3), indicating that the negative information outweighed the positive. This further supports our hypothesis that negative information will outweigh the positive when both forms of information are presented.

We next looked for an effect within the order of the information presentation. Under the condition of knowledge/no knowledge, we do not see a significant difference between the order of information presentation (Table 2.3). We ran tests of the WTP means between the ordered pre-information and no significant difference exists (no knowledge: p = .681; knowledgeable: p = .437). Similar results are obtained for post-information WTP (no knowledge: p = .739; knowledgeable: p = .1004). The results suggest that there is no order effect when the participants have prior knowledge or no prior knowledge.

We then evaluated this treatment with respect to trust and found that those with a prior trust of the food irradiation process decreased their WTP (p = .032, Table 2.4). In

evaluating this treatment under the condition of trust, we only see the possibility of small order effect. Marginally significant decreases in mean WTP are observed when negative information is presented subsequent to the positive when trust is present (p = .066). The mean decrease for the positive-then-negative sub-treatment was approximately 11 cents for those with trust (see Table 2.4). No change among either sub-treatment was observed when positive information was presented subsequent to the negative.

In coupling the trust and knowledge factors in this treatment, we note that in three of the sub-treatments (positive and negative –no trust/ knowledgeable, positive-then-negative – no trust/knowledgeable, and negative-then-positive – no trust/knowledgeable) the sample size was reduced to a point where tests of differences in means could not be performed (Table 2.5).

Even with that, we obtain valid data that helps us explain the interaction of these factors within this treatment. Before considering the order of information presentation, we see that under the conditions of trust and no knowledge, a decrease in WTP is observed. The mean WTP response decreased to \$0.0533 from \$0.1448 (Table 2.5) when presented with both forms of information (p = .029). This demonstrates that negative information tends to decrease valuation of the product, across the sub-treatments, most significantly when initial trust is present without prior knowledge.

In assessing an order effect, what we had seen with respect to trust alone is no longer evident. It is interesting to point out that now that we have coupled the factors, under the condition of trust with no prior knowledge, we see a significant decrease in WTP in the negative-then-positive sub-treatment (p = .053, Table 2.5). The negative

information, though presented prior to the positive information had a great deal of influence on participants with trust and who also lacked prior knowledge. Results under the condition of trust alone and coupled trust/knowledge factors lead us to conclude that the order of information presentation may in fact be influential on information effects. However, due to what appears to be conflicting results, more study into this area is warranted. Consequently, we present the estimates from regression analysis below.

Regression Analyses

To complement the descriptive analyses presented above, we also conducted regression analysis using data from all three treatments, with the third treatment separated by order of information presentation to definitively assess information effects on product valuation and the possible mitigating effects of prior knowledge and trust. Demographic variables are also included as control variables (see Table 2.6). The dependent variable of interest is WTP, with WTP pre-information being of interest in the first model, and WTP post-information of interest in evaluating the post-information presentation effects.

Our results indicate that WTP is significantly affected by trust but not prior knowledge in both pre-and post-information models. The post-information models also reveal the impact of the information provided during the surveys. Results suggest that the WTP of the second and third treatments or experiments (negative and positive-and-negative information) are significantly lower than the WTP of first treatment, *ceteris paribus*. Specifically, WTP of those given negative information and those given

positive-then-negative information is about 14 cents less than the WTP of those given positive information, across the post-information models exhibited in Table 2.6. The WTP of those given negative-then-positive information is about 10 to 11 cents lower than the WTP of those given positive information only. Hence, we find a slightly higher valuation from participants given negative-then-positive information than from participants given positive-then-negative information. However, this difference is not statistically significant. Therefore, consistent with our descriptive analysis, our regression results do not support the existence of order effects.

As exhibited in Table 2.6, we estimated the post-information models with or without prior knowledge and trust variables to determine if they moderate the information effects. Note that the magnitude of the information or treatment effects do not significantly change with or without the prior knowledge and trust variables in the models. Hence, we cannot definitively say that prior knowledge and trust moderate or mitigate the information effects.

Table 2.6

Willingness to Pay Regression Models

		Post-Information			
	Pre-Information	**Trust/ Knowledge**	**Trust/No Knowledge**	**No Trust/ Knowledge**	**No Trust/No Knowledge**
Variable[1]	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)
Knowledge	.0079 (.0397)	-.0099 (.0355)	-	-.0080 (.0366)	-
Negative information only	-	-.1385** (.0363)	-.1376** (.0360)	-.1410** (.0375)	-.1402** (.0372)
Positive-then-Negative information	-	-.1363** (.0460)	-.1358** (.0458)	-.1487** (.0473)	-.1483** (.0471)
Negative-then-Positive information	-	-.0969** (.0446)	-.0957** (.0442)	-.1117** (.0458)	-.1108** (.0454)
Initial Trust	.1392** (.0345)	.1005** (.0309)	.1004** (.0308)	-	-
Participant Age	-.0031** (.0012)	-.0014 (.0011)	-.0015 (.0010)	-.0012 (.0011)	-.0013 (.0011)
Participant Gender (1 if female)	.0922** (.0387)	.0297 (.0349)	.0321 (.0337)	.0229 (.0360)	.0249 (.0347)
Participant Income (1 if > $50,000)	.0372 (.0335)	-.0246 (.0301)	-.0244 (.0300)	-.0262 (.0310)	-.0260 (.0309
Hispanic Race	.1060** (.0411)	.0344 (.0369)	.0361 (.0363)	.0321 (.0381)	.0335 (.0375)
Other Races	.0329 (.0458)	-.0477 (.0408)	-.0467 (.0405)	-.0535 (.0421)	-.0527 (.0417)
Constant	.0484 (.0741)	.1450** (.0715)	.1425** (.0707)	.2138** (.0705)	.2117** (.0696)
R^2	.2034	.2126	.2121	.1548	.1545

[1] base variables: Positive information only and White race

**significant at the .05 level

-blanks represent variable(s) not applicable to the model

Summary and Conclusion

This study investigates the effect of information on consumers' product valuation as measured by willingness to pay (WTP). We survey people's WTP for an irradiated fruit before and after information regarding food irradiation is presented. The participants were randomly assigned into one of three treatment groups: positive information, negative information and mixed information. When mixed information is presented, the order effect (positive-then-negative vs. negative-then-positive) is also examined. In addition, we also explore the effects of prior knowledge and trust on the WTP and how these factors interact with information presentation. While information about products is widely prevalent in the marketplace, there has been no systematic investigation of how consumers react, in terms of product valuation, to positive and negative information, the order in which they are provided, and the moderating effect of prior knowledge and initial trust of the product on these information effects.

We conduct intensive analysis of the experiment results. Our results do not support the hypothesis that positive information significantly increases the WTP. On the other hand, we found that negative information, whether presented alone or with positive information, significantly decreases the WTP. However, as expected, WTP of subjects given positive information is significantly higher than the WTP of subjects given negative information or given mixed information.

When mixed information is presented, we find that WTP of those given negative-then-positive information is slightly higher than those given positive-then-negative information. This difference is not statistically significant however. This result does not

support the hypothesis that the order of information presentation (positive-then-negative vs. negative then positive) significantly influences the information effects. Crowley and Hoyer (1994) suggest that mixed or two-sided messages represent an important form of persuasive communication that has the potential to be effective for a variety of products in diverse marketing situations. Our results imply that the order in which the two-sided messages are presented may not significantly matter much in terms of their effect on product valuation. However, as expected, we find differences in effects of one-sided versus two-sided messages, especially between the effect of positive information and mixed information. WTP of those provided positive information is higher than WTP of those given mixed or two-sided information. Hence, our results do not support the finding of some studies which suggest that messages can include some negative information about a product and still be more effective than if no negative information were presented (e.g., Etgar and Goodwin 1982; Golden and Alpert 1987; Kamins and Assael 1987; Pechmann 1992). While these conflicting empirical results may be due to, among others, methodological differences between studies, the nature and amount of positive or negative information included are likely to be important determinants of two-sided message effects. Clearly, more research on two-sided or mixed messages is warranted as alluded to by Crowley and Hoyer (1994).

Interestingly, our regression results generally suggest that information effects on WTP are not mitigated by prior knowledge and trust. This finding may imply that marketers need not worry about consumers' prior knowledge and trust when predicting information effects on product valuation.

Our research focuses on the effect of positive, negative, and mixed information on product valuation. Given that information can differ on the basis of their source and its credibility (Sternthal, Dholakia, and Leavitt 1978; Ahluwalia, Burnkrant and Unnava 2000), future studies can factor in different sources of positive and negative information in the analysis to enrich the generalizability of the study. Our findings are also not generalizable to information reflecting a company's values or reputation. Further research could examine the effect of this type of information along with the type of information we examined in this study. We do not consider the effect of varying degrees of positive and negative information on product valuation. Prior research (Fiske 1980) suggests that extreme information is perceived as more diagnostic than moderate information and therefore is weighted more in overall evaluations. Future studies could assess the effects of varying the extremity of the positive and negative information on product valuation.

We expect that clever elicitation and in-depth investigation of the participants' perception of information credibility and quality might be able to further our understanding of the mechanism of information processing. Moreover, by taking into account the interaction between prior information and new information, we might be able to better understand the process of information updating. These topics are well beyond the scope this paper, but may be good topics for future studies. Lastly, the focus of our study is on product valuation of a relatively novel product in irradiated fruit. Future studies could replicate our study using other products (e.g., other types of novel

and/or non-novel products) and other product evaluation mechanisms (e.g., purchase intention) to test robustness of our findings.

CHAPTER III

HYPOTHETICAL NEW PRODUCT MARKETING RESEARCH: DOES CHEAP TALK PLAY A ROLE IN CONSUMERS' PRODUCT VALUATION?

Introduction

Traditional new product marketing research often relies on surveys in which participants are paid to answer questions about hypothetical purchase decisions. Because these studies are conducted in hypothetical situations with no purchase or consumption consequences for the participants, they are unable to uncover "true" consumer preference structures. Hence, in such hypothetical data collection exercises, participants may not experience strong incentives to expend the cognitive efforts needed to provide researchers with an accurate answer (Ding, Grewal and Liechty 2005). For example, in contingent valuation studies, participants have been found to overstate the amount they are willing to pay for an increase in quality of a private good. Evidence of this "hypothetical bias" is widespread (Cummings, Harrison and Rutstrom 1995; List and Gallet 2001; Loomis et al. 1997; Neill et al. 1994). To counter such problems, some research has begun to investigate means of calibrating hypothetical studies to non-hypothetical results obtained in experimental setting (Blackburn, Harrison, and Rutstrom 1994; Fox et al. 1998; List, Margolis, and Shogren 1998; List and Shogren 1998). Applications to new product marketing research of these *ex post* correction of hypothetical bias are limited, however, because extensive secondary data from actual

markets are unavailable when dealing with proposed new product introductions. Actual test marketing can be performed but these are expensive and should be conducted after some pre-market introduction research such as a consumer acceptance or willingness-to-pay (WTP) study. In addition, results from previous research imply that calibration factors vary on a case-by-case basis and hence, a specific calibration factor must be determined for each study (Lusk 2003).

An alternative method of reducing hypothetical bias is incorporating a "cheap talk" script that explains the problem of hypothetical bias to study participants prior to administration of a hypothetical question (Cummings and Taylor 1999). The premise behind this technique is that one might be able to reduce or eliminate hypothetical bias by simply making respondents aware of it regardless of its underlying causes. Cheap talk can be regarded as a nonbinding communication between a market researcher and survey respondent prior to administration of a hypothetical question. Lusk (2003) argued that the use of cheap talk is more general than calibration because it provides an *ex ante* bias correction.

Cheap talk has its roots in game theory where the interaction of players in the game is influential on other players and the game itself. This technique has been extended to use in economic studies dealing with contingent valuation but not in new product marketing research. For instance, Cummings and Taylor (1999) incorporated cheap talk into their study whereby participants were informed of the existence of hypothetical bias and its influence in increasing WTP. The aim was to inspire conscious awareness of the bias with the expected result being that the participants in their studies

would account for this bias and compensate their stated WTP. Different public goods were used in their study and three basic treatments were evaluated. The first treatment used real valuation whereas the second was hypothetical in nature. The third treatment incorporated cheap talk in a hypothetical scenario. Results indicated the existence of a hypothetical bias and this was mitigated to near real value numbers when cheap talk was included.

List (2001) utilized cheap talk in an experimental auction for a private good (a collectible baseball card). His work was an extension of Cummings and Taylor's (1999) work into a real-world environment. He found that a short cheap talk script was effective in eliminating hypothetical bias among subjects that possessed a lesser degree of knowledge of the good (nondealers) than among those with more awareness of the market for the good (dealers). In this study, List also notes that the dealers' WTP was lower than that of non-dealers. Murphy et al. (2005) performed a meta-analysis of 28 studies that utilized WTP. Their findings indicate support of the generally held belief that hypothetical bias increases WTP values beyond what would likely be paid in non-hypothetical situations. They found that the magnitude of the bias was the primary factor in explaining the bias, and that calibration techniques, including cheap talk, were effective in mitigating the bias.

While many in the field tout the benefits of utilizing cheap talk to address hypothetical bias, others urge caution because the evidence on cheap talk's robustness is mixed. Aadland and Caplan (2006) conducted telephone surveys utilizing a generalized cheap talk script to see if a more neutral cheap talk was effective in addressing

hypothetical bias across different types of goods. Their study design incorporated a public good (curbside recycling) with private good attributes (reduced garbage fees, convenience, etc.). Their cheap talk design did not reference higher hypothetical payment values as in Cummings and Taylor (1999) and List (2001). Their intentions were to ensure that they did not introduce an upward bias through wording of this type and left their reference to hypothetical bias a factor that leads people to "misstate" their WTP. They received mixed results in their study, finding that while hypothetical bias appears to exist, cheap talk may either mitigate or exacerbate the bias depending on its length, structure, and valence. Other studies have also evaluated the effect of short versus long script. Poe et al. (2002) found that a short script did not influence decisions. List (2001), as noted above, reported that long script did not reduce hypothetical bias with experienced card dealers. Brown, Ajzen, and Hrubes (2003) found that long cheap talk script was successful, but only for high payment amounts.

In addition to the mixed results in the literature, cheap talk studies to date have been limited to mostly laboratory setting. Cheap talk will be more valuable to market researchers if it can be applied in field market surveys or experiments. In addition, while cheap talk has been used in the non-market valuation literature, its application in hypothetical new product marketing research is very limited. The goal of this article is to explore the effect of cheap talk on consumers' valuation of a new product using a WTP field survey. Employing a payment card elicitation method, we found that WTP calculated from hypothetical responses with cheap talk is not statistically different from WTP estimated from hypothetical responses without cheap talk. We found some cheap

talk effects, however, among those who trust the product in one of the treatments. We also found that cheap talk has a mitigating effect on the influence of the treatment and control variables on willingness to pay. The next sections discuss the survey design, results, and conclusion.

Survey Design

To test the differences in consumers' valuation of a new product with or without cheap talk, we conducted a consumer survey of grocery shoppers in Texas and elicited their WTP for irradiated mangoes. Mangoes are a tropical fruit that are primarily imported into the United States because the climate is not generally well suited to domestic production. As they are a tropical fruit, prior to entering the country, they must be treated for insect pests that if present in the fruit shipment, could be detrimental to domestic crops. Food irradiation is a relatively new process from an adoption perspective and debate continues on its acceptability as a food process. Irradiated mangoes, and for that matter, irradiated fruit in general is not currently available in most markets in the U.S. Because of the hypothetical nature of a study of acceptance and WTP for irradiated mangoes, we were interested to see how cheap talk would influence consumers' valuation of the product.

We were also interested in examining the effect of different types of information about food irradiation on consumers' WTP for irradiated mangoes, with or without cheap talk. Two types of information were utilized in our study: positive and negative information. Information from the Government Accountability Office, a government

agency, stating the benefits of food irradiation comprised the positive information. Consequential food irradiation information from Public Citizen, a consumer advocacy organization, was used for the negative information. Hayes, Fox, and Shogren (2002) used similar information in the study of how countering information affects consumer choice, and Nayga, Aiew, and Nichols (2005) utilized similar positive information in their evaluation of positive information effects on consumer acceptance. We continue this type of work by presenting this information in three treatments; positive only, negative only, and both positive and negative. Additionally, we divide these treatments by using a cheap talk script in approximately one half of each treatment.

We were interested in the additional amount consumers would be willing to pay for irradiated mangoes, thus marginal WTP was the value of interest in our research. Marginal WTP was solicited from survey participants in the form of a payment card. Values for the payment card were calculated from pre-tests and according to a method described by Rowe, Schulze, and Breffle (1996). Respondents were informed of the average price of mangoes (50 cent each), which was provided to us by a supermarket chain. The payment card values and calculations are available from the authors upon request.

Consumer intercept surveys were conducted in grocery stores in major metropolitan areas of Texas in the late winter/early spring of 2006. Shoppers willing to participate were provided a brief information sheet about the survey and given a store coupon for a free item in the store (provided by the grocery chain). The sheet informed consumers of what mangoes are and why they must be treated for insects prior to

entering the country. Respondents were informed that food irradiation is a process that can be used to neutralize insects in fruit shipments, is an approved alternative to more conventional treatment methods, and uses energy versus more conventional insect control mechanisms. No additional information regarding food irradiation was provided at this point. In all, 352 surveys were conducted. However, due to incomplete survey responses, our study utilizes data from 304 participants.

Prior to the presentation of information, all participants were asked general questions about their shopping habits, knowledge of food irradiation, and attitudes toward and perceptions of food irradiation. Pre-information WTP for irradiated mangoes was solicited as well. Once this pre-information questioning was accomplished, participants were then randomly provided one or both forms of information as previously described. After the presentation of information, questioning about perceptions and attitudes regarding food irradiation was reaccomplished as was a post-information WTP using the same payment card values. Our cheap talk script was similar to that used by Carlsson, Frykblom, and Lagerkvist (2005). Murphy et al. (2005) indicates that hypothetical bias tends to be positive in nature. We chose to maintain reference to this positive effect in our description of this bias. We also included statements regarding budgetary constraints and asked participants to take this into account as well. The cheap talk script was included in the WTP questions (pre- and post-information) so that those participants randomly provided with this additional information received it immediately prior to their WTP response. The cheap talk script was as follows:

> Previous studies indicate that, individuals in general respond to surveys in a different way than they act in the real life. It is quite common to find that individuals say they are willing to pay higher prices than those that they are really willing to pay. We believe that this is due to the difficulty to calculate the exact impact of these higher expenses on the household economy. It is easy to be generous when in reality one does not need to pay more in the shop. I would then like to remind you that it is perfectly fine if you are not willing to pay any premium, given that paying extra for these irradiated mangoes will leave you with less disposable income for other products or savings.
>
> The average price for mangos in the past year was $0.50 each. How much more for each irradiated mango than this would you be willing to pay?

Results

We begin discussion of our results by a comparison of average WTP by treatment and control variables for all participants (Table 3.1), prior to differentiation by cheap talk. Pre- and Post-information means are presented and tested by each of these treatments and variables. The knowledge variable refers to participants' prior knowledge of food irradiation and is only applicable to pre-information WTP. Treatments correspond to each type of information presented during the surveys, and as such, are only applicable to post-information WTP. Income, Education, Female, and Trust are dichotomous choice variables, and Table 3.1 provides a brief description of these variables.

We observe that pre- and post-information WTP does not differ significantly based on income. We also see that prior knowledge and gender (post-information) does not change WTP regardless of the criteria in each variable.

It is interesting to point out that education does impact consumer WTP in that those participants with college degrees or higher were found to have lower pre- and post-information WTP, and the significance of this difference remains fairly constant.

Gender was found to be significant in that women were willing to pay approximately 77% more for irradiated mangoes than men before information was presented.

We observe that initial trust is significant in consumers' WTP. Differences of $0.12 and $.08 (pre- and post-information respectively) exist between those with trust in food irradiation versus those without it.

Our ANOVA indicates that differences in WTP exist among consumers from different races, however further analyses need to be performed to better identify precisely between which races the differences exist.

ANOVA also reveals that differences in post-information WTP exist depending on the type of information presented to participants. This test alone only identifies that at least one of the means differs, not which one, but observation of the positive information WTP mean leads us to believe a difference exists between it and the other treatments.

These analyses and presentation of means before and after the presentation of information provide general information to assist us in determining further analyses that needed to be performed. To examine the effect of cheap talk, additional evaluation is presented next to better explain our additional analysis.

Table 3.1

Willingness to Pay Means of Treatments and Control Variables[1]

			Pre-Information		Post-Information	
Variable	Criteria	n	Mean	*p* value	Mean	*p* value
Income	< $50,000/yr.	156	.1108		.0750	
	≥ $50,000/yr	148	.1002	.668	.0552	.371
	Difference in Means		-.0106		-.0198	
Education	< College Degree	156	.1325		.0898	
	≥ College Degree	148	.0774	.025**	.0396	.022**
	Difference in Means		-.0551		-.0502	
Female	Male	82	.0676		.0407	
	Female	222	.1197	.043**	.0745	.143
	Difference in Means		.0521		.0338	
Trust	No Trust	104	.0244		.0095	
	Trust	200	.1479	.000**	.0944	.000**
	Difference in Means		.1235		.0849	
Race	White	164	.0786		.0506	
	Hispanic	74	.0904	.003**	.0388	.013**
	Other Races	66	.1793		.1217	
Knowledge[2]	No Knowledge	213	.1159			
	Knowledgeable	91	.0816	.192	-	
	Difference in Means		-.0344			
Treatments[3]	Positive only	100			.1421	
	Negative only	100		-	.0310	.000**
	Positive-and-Negative	104			.0246	

** significant at the .05 level
[1]p values are from t-tests of WTP differences by variables with dichotomous choice responses and ANOVA tests where more than two criteria exists
[2]Applicable only Pre-Information
[3]applicable only Post-Information

We estimated the average WTP pre- and post-information presentation across the treatments and by presence/absence of cheap talk script. The results are reported in Table 3.2. As expected, cheap talk has no effect on pre-information WTP. The post-information WTPs without cheap talk are higher than mean WTPs with cheap talk when

positive information is presented in treatments one and three. This result is consistent with our prior expectation as the cheap talk is designed to mitigate the positive hypothetical bias associated with positive information. However, tests of differences between the means indicate that these differences in WTP means with and without cheap talk are not statistically significant. When only negative information is presented, mean WTPs without cheap talk are higher than those with cheap talk but again, these differences between means are not statistically significant. Overall, our results do not lend support to strong cheap talk effects.

Table 3.2

Tests of Willingness to Pay Means between Treatments, by Cheap Talk

			Pre-Information		Post-Information	
Treatment	Cheap Talk	n	Mean	*p*-value	Mean	*p*-value
Positive only	Yes	51	.1020	.283	.1212	.267
	No	49	.1448		.1638	
	Difference in Means (No – Yes)		.0428		.0426	
Negative only	Yes	45	.1085	.704	.0467	.458
	No	55	.1268		.0182	
	Difference in Means (No – Yes)		.0183		-.0285	
Positive-and-Negative	Yes	53	.0727	.849	.0233	.938
	No	51	.0805		.0260	
	Difference in Means (No – Yes)		.0079		.0028	

To complement the analysis above, we regressed the WTP values on the variables of cheap talk (dummy variable for presence/absence), treatment dummies (treatment 1, positive only as the base), and control variables for income (greater than or less than $50,000), education (college degree or less than college degree), gender (dummy for male/female), and race (white – base, Hispanic, and all other races). As shown in Table 3.3, the cheap talk variable is not statistically significant in both the pre- and post-information models. This finding is consistent with the results of statistical tests of the WTP means discussed above. As expected, results from the post-information regression model suggest that negative information decreases WTP regardless of whether it is presented alone or with positive information, as indicated by the negative and statistically significant coefficients of the treatment dummies.

Recall that our initial evaluation of WTP means by treatment and control variables identified some differences, and our regression models were evaluated by these significant findings to identify those treatments or variables, if any exist, that could be influenced by cheap talk. We regressed WTP pre- and post-information on these variables that were significantly different (in our first evaluation of means by cheap talk) to see if we could identify if under any conditions of these variables, cheap talk played a part in consumer WTP. The only variable that demonstrated significance was education (less than a college degree), and this was only marginally significant (cheap talk variable in the regression models had a *p* value of only .09). These regressions further verify almost without exception that cheap talk did not affect WTP.

Table 3.3

Williness to Pay Regression, Pre- and Post-Information

	Pre-Information WTP	**Post-Information WTP**
Variable[1]	Coefficient (SE)	Coefficient (SE)
Cheap Talk (1 if included)	-.0232 (.0234)	-.0042 (.0209)
Initial Trust (1 if trust)	.1265** (.0246)	.0767** (.0220)
Negative information only	-	-.1102** (.0256)
Positive then Negative information	-	-.1030** (.0255)
Knowledge (1 if knowledgeable)	-.0004 (.0271)	-
Participant Age	-.0015* (.0009)	-.0005 (.0007)
Participant Gender (1 if female)	.0564** (.0270)	.0304 (.0239)
Hispanic Race	.0873** (.0298)	.0565** (.0266)
Other Race	.0110 (.0309)	-.0159 (.0276)
Income (1 if > $50,000/yr.)	.0307 (.0252)	.0077 (.0227)
Education (1 if College Degree or higher)	-.0382 (.0257)	-.0383* (.0225)
Constant	.0412 (.0570)	.0935* (.0535)
R^2	.1483	.1557

[1]base variables are Positive Information only and White Race
**significant at the .05 level
*significant at the .10 level
- blanks represent variable(s) not used in the model

We attempted to segregate the analysis by level of trust of the product. Trust in food irradiation was determined by posing the question, "Would you trust irradiated food products?" to participants prior to the presentation of information. The response was a dichotomous variable "Yes" or "No". Our results also generally suggest the non-existence of cheap talk effects with the exception in the positive information only treatment for subjects who indicated that they trust the product. Here, the difference in the post-information WTP between cheap talk and no cheap talk is –0.08. Specifically, we found that WTP is 0.14 cents for subjects with trust of the product given the cheap talk script and 0.23 cents for subjects with trust of the product given no cheap talk script and this difference is statistically significant at the 0.10 level.

We were interested as well in the effect of cheap talk on the differences in WTP. Table 3.4 provides the regression results for the differences in WTP with and without cheap talk and also with and without initial trust. Results from these tests show that negative information alone or in combination decreases WTP except when the mixed information is presented to consumers without initial trust. However, we now see that negative information alone results in a greater change than when presented with positive information. We point these results out because when comparing the magnitude of the coefficients between the no cheap talk and with cheap talk regressions in Table 3.3, we note that cheap talk is effective in mitigating the results of the negative information as seen in the reduced negative information effect when cheap talk was present. Note as well that while most of the control variables were statistically significant in the no cheap talk regression model, these significant effects disappear in the cheap talk regression

model. We also see that the only significant control variable in the no trust regression model was income and this significance disappeared as well in the trust regression model.

In addition to our regressions of WTP pre- and post-information and WTP differences by no cheap talk versus cheap talk and no trust versus trust, we tested the coefficients of each of these models for equality. We found no significant difference in these model pairs. This demonstrates that the interaction of the variables does not influence the outcome, rather it is the information provided that causes the change, or in the case of trust, the trust influenced the difference in WTP, not its interaction with the other variables. The *p* values for these coefficients tests were as follows: WTP pre – post (.751), WTP differences by no cheap talk – cheap talk (.134), and these differences by no trust – trust (.226). We did observe that in the no trust – trust test of model coefficients, evaluated individually, we do observe significant differences in the gender and education variables' interaction with trust. However, these individual results did not influence the model comparison overall.

Table 3.4

Regression of Willingness to Pay Differences, by Cheap Talk and Initial Trust

	No Cheap Talk	**Cheap Talk**	**No Trust**	**Trust**
Variable[1]	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)
Initial Trust (1 if trust)	.0373 (.0278)	.0561** (.0289)	-	-
Cheap Talk (1 if Cheap Talk included)	-	-	-.0395* (.0333)	-.0082 (.0232)
Negative information only	.1243** (.0323)	.0836** (.0335)	.0732** (.0422)	.1183** (.0281)
Positive then Negative information	.0908** (.0332)	.0676** (.0321)	.1070 (.0401)	.0661** (.0285)
Participant Age	-.0016* (.0001)	-.0005 (.0010)	-.0011 (.0012)	-.0008 (.0008)
Participant Gender (1 if female)	.0566* (.0304)	-.0119 (.0313)	-.0468 (.0393)	.0494* (.0269)
Hispanic Race	.0653** (.0331)	-.0237 (.0356)	.0065 (.044)	.0313 (.0292)
Other Race	.0773** (.0364)	-.0142 (.0352)	.0047 (.0420)	.0423 (.0317)
Income (1 if > $50,000/yr.)	.0603** (.0285)	-.0320 (.0299)	.0653* (.0364)	.0024 (.0251)
Education (1 if College Degree or higher)	.0028 (.0286)	-.0038 (.0290)	-.0507 (.0361)	.0252 (.0249)
Constant	-.0782 (.0662)	.0002 (.0722)	.0446 (.0800)	-.0317 (.0565)
R^2	.1939	.0893	.1392	.1263

[1]base variables are Positive Information only and White Race
**significant at the .05
*significant at the .10 level
- blanks represent variable(s) not used in model

Conclusion

Our results clearly indicate that WTP values with and without cheap talk are not statistically different, suggesting the absence of cheap talk effects. Because irradiated mangoes have yet to be made commercially available, the good was undeliverable and a non-hypothetical treatment was not conducted. We would have wanted to conduct a non-hypothetical treatment with actual product and payment involved. This was not, however, possible because we could not find and acquire irradiated mangoes to use for the experiment during the conduct of the study. Hence, while certainly possible, our finding cannot unequivocally be interpreted as implying that cheap talk cannot reduce hypothetical bias. Our results simply imply that cheap talk script does not significantly reduce willingness to pay in the majority of our sample. It is possible that hypothetical bias did not exist to begin with. We found some cheap talk effects, however, among those who trust the product given positive information. We also found that cheap talk has a mitigating effect on the influence of the treatment and control variables on product valuation.

The study of cheap talk is still in its infancy and the conditions in which cheap talk is effective at reducing hypothetical bias are not fully known (Lusk 2003). While cheap talk has been used in the non-market valuation literature, its application in hypothetical new product marketing research is very limited. Future marketing research studies should test the robustness of our finding for other goods. Future studies should also evaluate the effect of using alternative payment vehicles (e.g., conjoint analysis) and include a non-hypothetical baseline or treatment if possible.

CHAPTER IV

INFORMATION EFFECTS, TRUST, AND WILLINGNESS TO PAY FOR IRRADIATED FOODS: A FIELD EXPERIMENT

Introduction

In this study, we investigate the controversial topic of food irradiation, although the design of our study could be used to address different new products about which consumers have little or incomplete information. The U.S. government has allowed the use of food irradiation on a number of products for several years (Henkel 1998, USDA 1999). Even with this approval, availability of irradiated foods, specifically fruits, remains limited. We investigate the effects of information on individuals' willingness to pay (WTP) for irradiated foods. Additionally, we evaluate how trust interacts with information in swaying consumer acceptance of irradiated foods. While a number of previous studies have focused on consumer acceptance issues related to irradiated foods (e.g., Bruhn 1995, Bruhn and Noell, 1987, Fox 2002, Frenzen et al 2001, Lusk, Fox, and McIIvain 1999, Nayga, Aiew, and Nichols 2005, Resurreccion et al 1995), our study specifically looks at WTP and the interaction with varying forms of information: positive, negative, and mixed (positive and negative) as well as trust pre and post-information presentation.

Positive information, when presented alone, has been demonstrated to increase product acceptance (Hayes, Fox, and Shogren 2002; Nayga, Aiew, and Nichols 2005). On the other hand, the literature, especially the impression formation literature, found

that negative information effects far outweigh positive information effects (e.g., Klein 1996; Kroloff 1988; Skowronski and Carlston 1989; Wright 1974). For example, it has been shown that negative attributes generally have a stronger influence on consumers' judgments on product quality than positive attributes (Fiske 1980). Similarly, negative personality traits have been shown to have a greater influence on interpersonal judgments (Skowronski and Carlston 1987) and negative word of mouth has been shown to have a stronger impact than positive word of mouth (Herr, Kardes, and Kim 1991). Negative information, whether presented alone or in combination with positive information has also been shown to decrease product acceptance (Hayes, Fox, and Shogren 2002). For example, negative media coverage and activities by activist organizations that oppose biotechnology are influential in reducing acceptance of this technology (Hoban 1998).

Trust held by consumers is another theme of a number of studies found in the literature. It is well known that people tend to perceive new information as compatible with their prior beliefs (Hoch and Ha 1986). The mechanism for these initial beliefs is similar to that associated with a confirmatory bias or sticky prior beliefs (Bolton 2003; Jonas et al. 2001; Klayman 1995; Schwenk 1986) and Biyalogorsky, Boulding, and Staelin (2006) refer to this path as "belief inertia distortion". When consumers hold extreme attitudes about potential hazards, information is not likely to be influential (Frewer 2000). Prior beliefs have been found to be reinforced by initial trust or distrust (Slovic 1993). However, trust, especially in new technologies, is not earned over night; rather it takes time (Sapp 2003).

Our study continues work in this area by examining how information and trust interact with consumers' acceptance of and WTP for new products. We use irradiated mangoes as a product of interest. Mangoes are a tropical fruit that are primarily imported into the U.S. because most of the domestic climate is unsuitable to their growth. Food irradiation is the process of exposing food to ionizing radiation for the purposes of food safety or control of insect pests. The food irradiation process currently is performed with one of two highly technological processes, utilizing either radioactive materials or electrically generated high-energy particles. Though this study does not attempt to differentiate consumer perceptions based on these technologies, it is at least in part the highly technical nature of food irradiation that causes much of the debate over food irradiation. Consumer fear of food irradiation may be a result of a lack of understanding of the process and concerns that irradiated foods may be perceived as processed versus fresh (Henson 1995). From a food safety perspective, consumers perceive food safety as a given and not of value (Henson 1995), further leading us to question consumers' willingness to pay for irradiated mangoes.

Because mangoes are imported from countries that may have insect pest issues that would be detrimental to U.S. crops, phytosanitary control measures must be taken to prevent the importation of these pests, and food irradiation is an approved process for this purpose. Most studies regarding food irradiation deal with food safety aspects of this technology. Regardless of the reason for the treatment, food irradiation continues to be a controversial topic and though the personal benefit to consumers of food irradiation for

food safety purposes may not be evident in phytosanitary control uses, the negatively described consequences do not differ regardless of reason for irradiation.

The public is continually exposed to information about a vast variety of products available for purchase. Many of these products are designed for consumption, whether it be food or drug. Regardless of the purpose of consumption, varying information regarding the benefits or consequences of many products are readily available to consumers through manufacturers, retailers, the media, government agencies, consumer groups, the internet, etc. In the food market, these differing forms of information, beneficial (positive) or consequential (negative), arise from two basic sources not directly related to the manufacturer. Government agencies regulate the production of food to ensure food safety, protect domestic production, and ensure consumer welfare. Consumer activist organizations act as non-governmental watchdogs and investigate and report on practices and activities of food producers that affect consumers. While both of these groups provide information that is both positive and negative, government agencies tend to support positive aspects of foods and the processes and technologies used to produce them, while consumer groups identify more negative information, especially regarding controversial issues such as genetically modified organisms (GMOs), BSE (Bovine Spongiform Encephalopathy or Mad Cow Disease), and food irradiation.

We utilize information from a government agency as a source of positive information and information from a consumer activist organization as a source of negative information in our study. We then use a field experiment to test the effect of

information on consumers' acceptance of, and WTP for irradiated foods. Our results generally suggest that positive information increases WTP but more so for those without initial trust of food irradiation while negative information, whether presented with positive information or alone, reduces WTP but only for those with initial trust. Our results also suggest that those with initial trust of food irradiation generally have higher WTP pre- and post-information than those who do not have initial trust. Positive information increases trust while negative information, whether presented with positive information or alone, decreases trust. Hence, negative information dominates positive information and decreases both trust and WTP. The next sections discuss the study design, results, summary discussion, and conclusion.

Study Design

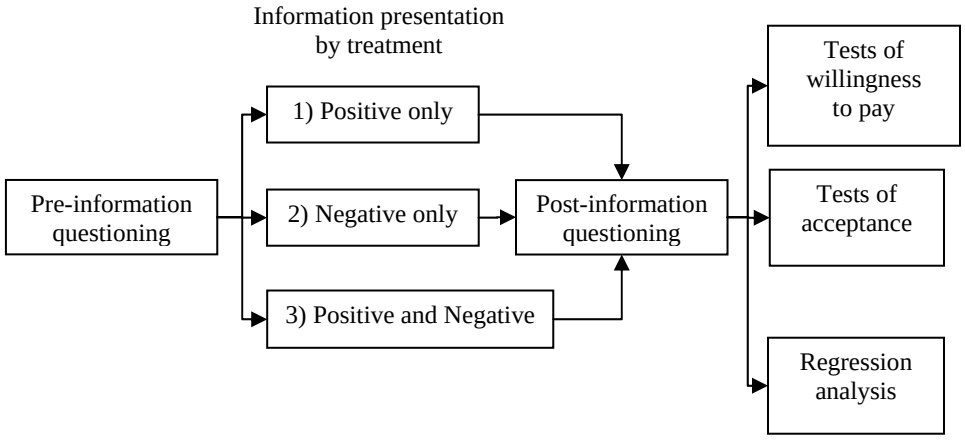
We use a field experiment (Harrison and List 2004) in our evaluation of consumer acceptance of, and WTP for irradiated foods as measured through responses received from grocery shoppers in a number of cities in Texas. We intercepted consumers in grocery stores and asked that they participate in a consumer study regarding a food technology that involved fresh mangoes. Those willing to participate were provided an information sheet that described what mangoes are, where they are from, and explained the need to treat them for insects prior to entering the country (Appendix C). We also salved participants to food irradiation by describing this as an approved, alternative process that uses energy as compared to conventional pest control

treatments (such as chemical fumigation or hot water baths, though these alternatives were not explicitly provided).[2]

Three different treatments were utilized during the surveys in which differing forms of food irradiation information were provided to consumers (see Figure 4.1). Common among all treatments was pre-information questioning regarding shopping and purchase habits, trust in food irradiation, and WTP for irradiated mangoes. WTP was solicited in the form of a payment card, which will be subsequently described. After the initial WTP was recorded, food irradiation information was then provided to survey participants.

Figure 4.1

Experiment Structure



The treatments consisted of three varying types of food irradiation information. The first stated the benefits of food irradiation (Appendix A) and we refer to this as positive information (POS). The second treatment involved presenting consequential

[2] Participants were also offered a coupon (provided by the grocery chain) for a free item in the store.

information to participants, which we refer to as negative information (NEG) (Appendix B). In the third treatment, we presented both forms of information and identify this as positive-and-negative information (POSNEG). In all, 352 individuals participated in the study. Due to incomplete responses, we dropped 48 observations from our study. An additional 2 observations were dropped where trust and WTP inconsistencies were observed (trust increased or decreased and WTP changed in the opposite direction).

Data Summary

Our sample consists of 302 subjects. Among the treatments, 99 subjects participated in the positive information treatment (POS), 100 in the negative information treatment (NEG), and 103 in the positive-and-negative information treatment (POSNEG). Table 4.1 provides a summary of the demographic constitution of subjects. We observe that a majority of participants are female, which is consistent with other consumer studies of this type (Huffman et al. forthcoming, Hashim, Resurreccion, and McWatters 1995, Malone 1990). Additionally, we observe that income is relatively equally distributed among our categories and approximately one half of the participants have a college degree or higher. A majority of participants resided in cities, which is expected as the study was conducted in major metropolitan areas to obtain a wider demographic representation.

Table 4.1

Survey Participants' Demographics (n=302)

Variable	Description	Mean	SD
Age	Participant's age	45.6	14.684
Gender	1 if female	.7285	.4455
Married	1 if married	.6026	.4902
	Race or Ethnic Origin		
White	1 if participant is white	.5397	.4992
Afam	1 if participant is African American	.1358	.3431
Hisp	1 if participant is Hispanic	.2450	.4308
Racoth	1 if participant is from other race/ethnic group	.0795	.2709
	Highest Level of Education Attained		
Hsless	High school education or less	.2550	.4366
somecol	Some college	.2583	.4384
college	College degree	.3411	.4749
advanced	Advanced degree	.1457	.3534
	Employment Status (Full Time or Less than Full Time)		
employ	1 if employed full time	.6887	.4638
	Annual Household Income		
Ioto29	income < $30,000	.2483	.4328
I30to49	$30,000 <= income < $50,000	.2682	.4438
I50to74	$50,000 <= income < $75,000	.2219	.4162
I75Plus	$75,000 <= income < $100,000	.2616	.4402
	Area of Residence (City or Suburban/Rural)		
Area	1 if participant live in the city	.6325	.4829

Payment Card

A payment card was utilized in the solicitation of WTP. In a payment card, subjects are presented with a range of monetary amounts and are asked to identify the maximum amount they would be willing to pay. Marginal WTP (i.e. willingness to pay extra compared to non-irradiated mango) was utilized instead of a WTP unit price as this allows participants to better "picture" the extra expenditure on food if paying more for the irradiated product (De Ridder and De Graeve 2005). The average market price for mangoes in the previous year was $0.50 each (provided by the grocery chain) and was used in the payment card calculation. The categorical values used in the payment card

were determined based on pre-tests and were calculated using the method described in Rowe, Schulze, and Breffle (1996).

Based on the pre-tests, we offered choices within the range of 0-50 cents and an option of "more than $0.50". Therefore, subjects with marginal WTP equal to or less than zero are reported to have a zero (lowest category) WTP. On the other hand, people with WTP greater than 50 cents (highest category) are reported with a non-numerical value ("greater than 50 cents"). If we simply use zero and 50 cents as their WTP for these lowest and highest categories, our statistical analysis may suffer from measurement errors. Consequently, we use an alternative method. Under the assumption that the underlying WTP distribution is a sufficiently smooth function, we can estimate the entire WTP distribution based on the discrete information obtained from our payment card report. Wu and Perloff (forthcoming) propose a density estimator based on grouped data using the maximum entropy density method. By matching the population and sample moments for each WTP interval, this estimator is able to obtain an accurate approximation of the underlying distribution. The density function has a flexible functional form

$$f(x) = \exp(-\sum_{i=0}^{K} \lambda_i x^i) .$$

It is known that this maximum entropy density nests many commonly used distributions. With *K=2*, it coincides with the normal distribution. When *K=4*, this density is able to accommodate skew and/or fat-tailed distribution, or even multi-modal distribution. Moreover, the support of the unknown distribution is allowed to be the real line. This extra degree of freedom is particularly useful for our purpose, as we are

interested in the truncated mean of WTP for people reporting zero or greater than 50 cents WTP.

For our estimation, we set $K=4$, and estimate the underlying WTP distribution for each treatment scenario before and after treatment. With the estimated density, we evaluate the truncated average WTP for people reporting zero and greater than 50 cents WTP. Note that although we allow the support of the density to be the real line, the estimates suggest that the underlying distribution is likely to range from [-10, 65] cents.

Results

In this section, we use the experiment results to test a number of hypotheses of interest. We also use regression analysis to investigate the simultaneous effects of various factors. We then discuss the effect of information presentation and trust on consumers' acceptance and WTP based on the findings of our experiment.

Information and Trust Effects

We designed experiments to evaluate the differential effects of information presentation (POS, NEG, and POSNEG) on WTP. In addition to WTP changes resulting from information presentation, we were interested in additional measures of consumer acceptance of food irradiation. Therefore, we further investigate how consumer trust and WTP change simultaneously with the presentation of information.

The WTP means by treatment are presented in Table 4.2. In this table, we also provide t-tests of equal means before and after the information presentation. Table 4.3

provides t-tests of equal means between treatments, pre- and post-information presentation. The results suggest that other than a marginal difference between the first and third treatments, no significant differences in average WTP exist between treatments prior to information presentation. These results are consistent with the randomness of treatment assignment among our surveys.

Table 4.2

Willingness to Pay Means and t-Tests
(Pre-Post Information) by Treatment

Treatments	n	Pre/Post information	Mean	*p*-value
Positive Only	99	Pre	.1236	.0814*
		Post	.1425	
		Difference (Post – Pre)	.0189	
Negative Only	100	Pre	.1186	.0000**
		Post	.0310	
		Difference (Post – Pre)	-.0876	
Positive and Negative	103	Pre	.0744	.0032**
		Post	.0229	
		Difference (Post – Pre)	-.0514	

**significant at the .05 level
*significant at the .10 level

Table 4.3

Tests of Mean Willingness to Pay Differences between Treatments (Pre- and Post-Information)

Treatments	n	Pre-information Mean	Pre-information *p*-value	Post-information Mean	Post-information *p*-value
Positive only - Negative only	99	.1236	.8715	.1425	.0001**
	100	.1186		.0310	
	Difference	.0050		.1115	
Positive only - Positive and Negative	99	.1236	.0861*	.1425	.0000**
	103	.0744		.0229	
	Difference	.0493		.1196	
Negative only - Positive and Negative	100	.1186	.1608	.0310	.7531
	103	.0744		.0229	
	Difference	.0442		.0081	

** significant at the .05 level
* significant at the .10 level

We performed a t-test of WTP means for treatment 1 (POS) to evaluate the difference in consumer WTP pre- and post-information (Table 4.2). The WTP means, pre-information ($.1236) and post-information ($.1425), were found to differ marginally (p=.0814). This appears to support our hypothesis that when positive information is presented alone, WTP will increase. However, because of the marginal statistical significance and our interest in the role of initial trust in food irradiation, we further investigate this result.

We performed a similar test, but this time we separated the responses by initial trust. In Table 4.4, we observe that for subjects without trust, the mean WTP before information presentation is lower than that of those with initial trust. However, we observe that positive information was successful in swaying consumers without initial trust to increase their WTP for irradiated food (increase of $.0528, p=.0154).

Participants possessing trust were not influenced and their WTP increased insignificantly ($.004, p=.7355). In a study of acceptance of genetically modified foods, Huffman et al. (forthcoming) also found similar results regarding prior beliefs and a lack of increased willingness to pay.

Table 4.4

Tests of Mean Willingness to Pay Differences within Treatments by Initial Trust (Post – Pre-Information Presentation)

Treatment	Pre/Post Information	No-Trust			Trust		
		n	Mean	*p*-value	n	Mean	*p*-value
Positive only	Pre	30	-.0112	.0154**	69	.1822	.7355
	Post		.0415			.1864	
	Difference (Post – Pre)		.0528			.0041	
Negative only	Pre	34	.0551	.2632	66	.1513	.0000**
	Post		.0181			.0377	
	Difference (Post – Pre)		-.0370			.1136	
Positive and Negative	Pre	39	.0179	.1179	64	.1088	.0126**
	Post		-.0275			.0536	
	Difference (Post – Pre)		-.0453			.0552	

**significant at the .05 level
*significant at the .10 level

Our hypothesis was that negative information presented alone would result in decreased WTP. We found that WTP did decrease from an average of $.1186 to $.0310 after this information was provided (p=.0000) (see Table 4.2). Thus, the hypothesis was supported and we further investigate these results by the trust factor.

We observe test results by trust/no trust (Table 4.4) and see that those consumers lacking initial trust did not change their responses after the negative information was presented (p=.2632). Those that held an initial trust in food irradiation reported a higher

pre-information WTP than did those without trust. This value significantly decreased for those with initial trust from $.1513 to $.0377 ($p$=.0000).

When both forms of information were presented (POSNEG), our test results indicate a decrease in WTP as hypothesized. WTP decreased by $.0514 ($p$=.0032) (see Table 4.2). Evaluating this treatment by trust shows that consumers with no initial trust were not swayed when positive and negative information were presented together (p=.1179), indicating that this initial perception was strong enough to maintain low WTP. Among consumers with initial trust, we do identify a significant change in WTP. Pre-information WTP was $.1088 and decreased significantly to $.0536 ($p$=.0126) (Table 4.4) after the information was provided. Hence, similar results are evident in the NEG and POSNEG treatments. This finding is consistent with Hayes et al.'s (2002) study of information effects on consumer WTP for irradiated pork where they revealed that when positive information is presented with negative information, decreases in acceptance with the mixed information is similar to that when negative information is presented alone.

Our results also suggest that initial trust held by consumers does interact with WTP. This trust-information interaction differs based on the type of information presented. To further investigate the initial trust/treatment interactions, we looked at WTP by initial trust both pre- and post- information within treatments. Table 4.5 reports test results, by treatment comparing WTP by initial trust pre- and post-information presentation.

Table 4.5

Tests of Mean Willingness to Pay Differences Pre- and Post Information
(By Trust – No Trust Initially Held)

			Pre-Information		Post-Information	
Treatment	Trust	n	Mean	*p*-value	Mean	*p*-value
Positive only	No	30	-.0112		.0415	
	Yes	69	.1822	.0000**	.1864	.0000**
	Difference (Yes – No)		.1935		.1449	
Negative only	No	34	.0551		.0181	
	Yes	66	.1513	.0650*	.0377	.6471
	Difference (Yes – No)		.0961		.0196	
Positive and Negative	No	39	.0179		-.0275	
	Yes	64	.1088	.0263**	.0536	.0187**
	Difference (Yes – No)		.0909		.0811	

**significant at the .05 level
*significant at the .10 level

Prior to information presentation, we see that regardless of treatment, consumers possessing trust in food irradiation had significantly greater WTP than those without this initial trust. Similar results are evident in the post-information WTPs with the exception of the NEG treatment. In the POS treatment, we see that consumers with initial trust maintained a higher WTP than those lacking the trust ($.1864 vs. $.0415). However, even with this difference, recall from previous discussion that the change was only significant for those lacking an initial trust in this treatment. We see that though mean WTP was lower for those without initial trust in this treatment, it did increase as a result of the positive information presentation.

We also note that the negative information presentation was effective in reducing WTP especially for those with initial trust. We observe no significant difference, however, in post-information WTP between subjects with or without initial trust

(p=.6471). Interestingly, we find that when the POSNEG treatment was evaluated post-information between those with and without initial trust, the WTP of those with an initial trust was greater than the WTP of those without this trust. Though these subjects with trust did decrease their WTP significantly as previously seen, the degree of that change was greater, indicating that the negative information inclusion in this treatment was effective in reducing WTP, but prior trust resulted in a higher post-information WTP than among those without trust. As trust is inherent to consumers and difficult to quantify into monetary values, qualitative evaluation may further enlighten as to how information interacts with this variable. Such an evaluation is subsequently made in this study.

Acceptance Results

Table 4.6 provides a summary of the results of the direction of changes in trust and WTP (after information presentation) for all treatments combined as well as broken down by treatment.[3]

In the POS treatments, we see that 22 participants increased their WTP after the presentation of information and 18 increased their trust. Comparing this to 6 that decreased WTP and only 2 that decreased trust, we see that positive information was successful in overwhelmingly increasing trust and WTP as hypothesized. The p-value from our F-test is .0055.

[3] We note here that this is where we discovered the two participants with conflicting trust and WTP changes which were removed for our analyses and are not included in this table.

Table 4.6

Trust and Willingness to Pay Changes by Treatment

ALL DATA	Change in WTP			
Change in Trust	Decrease	No Change	Increase	Total
Decrease	29	20	0	49
No Change	34	173	20	227
Increase	0	12	14	26
Total	63	205	34	302

POS	Change in WTP			
Change in Trust	Decrease	NoChange	Increase	Total
Decrease	0	2	0	2
No Change	6	60	13	79
Increase	0	9	9	18
Total	6	71	22	99

NEG	Change in WTP			
Change in Trust	Decrease	No Change	Increase	Total
Decrease	22	8	0	30
No Change	15	50	2	67
Increase	0	2	1	3
Total	37	60	3	100

POSNEG	Change in WTP			
Change in Trust	Decrease	No Change	Increase	Total
Decrease	7	10	0	17
No Change	13	63	5	81
Increase	0	1	4	5
Total	20	74	9	103

Data from the second treatment (NEG) also supports our hypothesis that negative information will decrease both trust and WTP. We see that 37 participants decreased their WTP and 30 decreased their reported trust after negative information was presented (p=.0000). Only 2 indicated an increase in trust and WTP.

We see in the POSNEG treatment that trust and WTP decreased similar to that in the NEG treatment. Twenty and 17 consumers decreased their WTP and trust, respectively, (p=.0000) as compared to increases by 9 subjects for WTP and 5 subjects for trust.

We also performed tests of pre- and post-information trust by treatment and change in WTP (see Table 4.7). The results of these tests indicate that although WTP may not change, trust does change in accordance with our hypotheses. In the first treatment, we observe that when WTP decreases, the sample size is insufficient to make an accurate assessment using our test methods. However, we see that when WTP was unchanged, trust did increase as result of the positive information (p=.0338). As expected, when WTP increased, trust too increased (p=.0010).

Decreased WTP in the second treatment corresponded to significantly decreased trust attributable to the negative information. Mean trust decreased by .5946 (p=.0000). When WTP did not change in this treatment, we continue to see a decrease in trust (p=.0571). Trust in this treatment did increase for 3 consumers with a corresponding increase in WTP. However, we could not make an accurate assessment of the role of trust in this case due to small sub-sample size.

Table 4.7

Tests of Change in Trust by Treatment and Change in Willingness to Pay

Treatment	Change in WTP	n	Initial/Post Trust	Mean	*p*-value
Positive only	Decrease	6	Initial	1.0000	-
			Post	1.0000	
			Difference (Post – Initial)	.0000	
	No Change	71	Initial	.7042	.0338**
			Post	.8028	
			Difference (Post – Initial)	.0986	
	Increase	22	Initial	.5909	.0010**
			Post	1.0000	
			Difference (Post – Initial)	.4091	
Negative only	Decrease	37	Initial	.7568	.0000**
			Post	.1622	
			Difference (Post – Initial)	-.5946	
	No Change	60	Initial	.6000	.0571*
			Post	.5000	
			Difference (Post – Initial)	-.1000	
	Increase	3	Initial	.6667	.4226
			Post	1.0000	
			Difference (Post – Initial)	.3333	
Positive and Negative	Decrease	20	Initial	.6500	.0047**
			Post	.3000	
			Difference (Post – Initial)	-.3500	
	No Change	74	Initial	.6351	.0058**
			Post	.5135	
			Difference (Post – Initial)	-.1216	
	Increase	9	Initial	.4444	.0353**
			Post	.8889	
			Difference (Post – Initial)	.4444	

**significant at the .05 level
*significant at the .10 level

We hypothesized that trust would decrease when both forms of information are presented as a result of the inclusion of negative information, which was expected to dominate the positive information. Our tests of trust change in this treatment generally further support this hypothesis. We see that when WTP decreased or did not change, trust decreased (p=.0047 and .0058 respectively). We point out that while the overall results support our hypothesis, those consumers in the minority (9 participants) in this treatment that did increase their WTP, also increased their trust (p=.0353). This observation is consistent with positive only information. However, evidence from a majority of responses continues to support our hypothesis that negative information dominates the positive and decreases trust and WTP when presented together and compared pre- and post-information.

We have just shown that trust changes as expected depending on the information presented. Now we are interested to see if trust is a factor in changing WTP among the different treatments (Table 4.8). In the POS treatment, we see that the sub-sample size is insufficient to make an accurate evaluation when trust decreases. However, when trust does not change or increases, we can make inferences. When trust is unchanged after positive information is presented, we observe no change in WTP (p=.7064), and when trust increases, WTP does significantly increase (p=.0160).

Assessment of the NEG treatment reveals that when trust has decreased, WTP decreases significantly (p=.0000). Similar change in WTP is observed when trust is unchanged as seen in a $.0341 decrease ($p$=.0249). Once again, the number of

consumers responding with increased trust in this treatment was not sufficient to make an accurate assessment.

Table 4.8

Tests of Change in Willingness to Pay by Treatment and Change in Trust

Treatment	Change in Trust	n	Pre/Post WTP	Mean	*p*-value
Positive Only	Decrease	2	Pre	.2206	.5000
			Post	.2224	
			Difference (Post – Pre)	.0018	
	No Change	79	Pre	.1506	.7064
			Post	.1546	
			Difference (Post – Pre)	.0040	
	Increase	18	Pre	-.0054	.0160**
			Post	.0805	
			Difference (Post – Pre)	.0859	
Negative Only	Decrease	30	Pre	.1672	.0000**
			Post	-.0704	
			Difference (Post – Pre)	-.2376	
	No Change	67	Pre	.0982	.0249**
			Post	.0641	
			Difference (Post – Pre)	-.0341	
	Increase	3	Pre	.0883	.3893
			Post	.3064	
			Difference (Post – Pre)	-.2181	
Positive and Negative	Decrease	17	Pre	.0879	.0097**
			Post	-.0509	
			Difference (Post – Pre)	-.1389	
	No Change	81	Pre	.0776	.0049**
			Post	.0293	
			Difference (Post – Pre)	-.0482	
	Increase	5	Pre	-.0235	.1372
			Post	.1700	
			Difference (Post – Pre)	.1935	

**significant at the .05 level
*significant at the .10 level

In the POSNEG treatment, we observe similar results when negative information is presented. Results indicate significant decreases in WTP when trust decreases or is unchanged. A decrease of $.1389 ($p$=.0097) and of $.04822 ($p$=.0049) occurred under decreased and unchanged trust, respectively.

We then further examined the change in trust separate from WTP and evaluated how information affects this belief. For this, we performed t-tests of the difference in reported trust pre- and post-information (see Table 4.9). When presented only positive information, mean trust did increase (p=.0002). When only negative information was presented, trust decreased significantly by .27 (p=.0000) and similarly when presented both positive and negative information (decrease by .1165, p=.0098).

Table 4.9

Tests of Trust Means by Treatment
(Post Information – Initial Trust)

Treatment	n	Initial/Post Trust	Mean	*p*-value
Positive Only	99	Initial	.6970	.0002**
		Post	.8586	
		Difference (Post – Initial)	.1616	
Negative Only	100	Initial	.6600	.0000**
		Post	.3900	
		Difference (Post – Initial)	-.2700	
Positive and Negative	103	Initial	.6214	.0098**
		Post	.5049	
		Difference (Post – Initial)	-.1165	

**significant at the .05 level
*significant at the .10 level

Regression Results

To complement our analyses above, we performed regression analyses[4] using data from all three treatments and factors of trust (see Table 4.10). In our pre-information WTP regression, we utilize initial trust as a variable of interest along with demographic control variables. We observe that initial trust significantly contributes to WTP prior to information presentation. We also observe that female and Hispanic consumers are willing to pay more prior to information presentation while as age increases, WTP decreases.

In the second model (i.e., post-information model), we analyze changes in WTP by whether trust is present initially and its corresponding post-information result. Four different possibilities exist: with trust present before and after information, with trust present before but not after information, with trust absent before but present after information, and when trust is absent before and after information presentation. The fourth option is used as the base in the regression model. Our results indicate that regardless of whether trust is present initially, if it is present post-information presentation, WTP after the information is provided is higher than when it is absent. The presence of post-information trust supports our previous hypotheses that WTP will increase among consumers with trust in food irradiation. Additionally, we observe that the coefficient for those with initial trust is greater than that of those without initial trust, further supporting the role of trust in WTP.

[4] We performed OLS regression utilizing our imputed upper and lower WTP means. As a measure of robustness, Tobit regression was performed on the original, unimputed data (censored at 0 and .5 – lower an upper respectively). We found no statistically significant differences in our regression models (OLS versus Tobit) and only the OLS is presented in Table 4.10.

In our second regression model, we also included variables for treatment. We see that the POS treatment is significant and positively influences WTP post-information, indicating that as we have previously observed, positive information increases WTP. The control variables observed in our first regression continue to be significant, though slightly less so, and we also see that consumers with lower education levels (high school or less) tended to increase their WTP after information was presented.

A third factor in our post-information regression model was the interaction of initial trust and the presentation of information. Using the interaction of initial trust and the positive treatment as a base, we observe significant decreases in WTP when negative information (alone or with the positive information) is presented to consumers that initially trusted food irradiation.

Table 4.10

Willingness to Pay Regression Analyses
(Pre- And Post-Information)

	Pre-Information		**Post-Information**	
Variable	Coefficient	SE	Coefficient	SE
trusttrust (trust both pre- and post information)	-	-	.2520**	.0455
trustnotrust (trust pre- but not post-information)	-	-	.0741	.0543
notrusttrust (trust post- but not pre-information)	-	-	.1674**	.0448
neg (negative information treatment)	-	-	.0742	.0480
posneg (mixed (both) information treatment)	-	-	.0121	.0455
neg*trust1 (interaction of neg and initial trust)	-	-	-.1564**	.0578
posneg*trust1 (interaction of posneg and initial trust)	-	-	-.0980*	.0545
trust1 (initial trust held by participants)	.1205**	.0252	-	-
age (participant age)	-.0016*	.0009	-.0012*	.0007
female (gender)	.0529*	.0272	.0441*	.0228
area (area of residence (city or suburban/rural))	.0349	.0262	.0320	.0218
afam (African American)	.0208	.0366	-.0034	.0303
hisp (Hispanic)	.0787**	.0316	.0458*	.0262
racoth (other races)	-.0067	.0457	-.0133	.0377
hsless (education – high school or less)	.0526	.0340	.0504*	.0281
somecol (education – some college)	.0407	.0315	.0007	.0262
advanced (education – advanced degree)	-.0034	.0374	-.0040	.0308
I0to29 (income ($0-$29,999))	-.0480	.0334	-.0577	.0275
I50to74 (income ($50,000 - $74,999))	.0378	.0350	.0164	.0289
I75plus (income ($75,000 or greater),)	.0076	.0339	.0005	.0671
employ (full time employment= 1)	-.0228	.0268	-.0351	.0220
constant	.011	.0694	-.0082	.0283
R^2	.1632		.3102	

**significant at the .05 level
*significant at the .10 level
- blanks represent variable(s) not included in the model

Summary and Discussion

Information affects consumers' WTP for irradiated food. We hypothesized that positive information would increase WTP, which held true, *ceteris paribus*. Nayga et al. (2005) found similar results in their study of irradiated ground beef. Similar to Hayes et al. (2002), we also found support of our hypotheses that negative information would decrease WTP regardless of whether it is presented alone or in combination with positive information.

Trust of food irradiation held by consumers was of interest to be evaluated with our information treatments. We found that when there was an initial trust, WTP did not change for the POS treatment. The opposite was observed for the NEG and POSNEG where a change (decrease) in WTP was observed only when consumers possessed initial trust. In their study of consumer acceptance of GMOs, Huffman et al. (forthcoming) also found similar results among consumers with informed prior beliefs.

These results indicate that when the valence of the initial trust factor matches the valence of the information presented (trust = positive, no trust = negative), information will not be influential on consumer WTP.

We observed higher WTP pre-information across all treatments when subjects held an initial trust. As expected, post-information WTP was greater when the information was positive and differed significantly from those without trust. When negative information is presented, we found that the post-information WTP for those with an initial trust was not only lower than it was pre-information, but also that it did not significantly differ from those consumers that did not have an initial trust.

Acceptance of irradiated foods may be represented by changes in WTP, however the change in trust alone and interacting with the information sheds more light on this subject. We generally see similar results between trust and WTP changes resulting from the type of information presented, but this does not necessarily hold true under all conditions.

In testing trust without regard to WTP, our results indicate that change in trust follows our hypotheses in that positive information increases trust while negative information (alone or in combination with positive) decreases trust. To identify any contrary results, we evaluated trust and WTP by treatment and looked at the changes in each of these variables while comparing them to the individual changes in the other. We found consistencies in change of WTP and trust (increasing or decreasing) in most cases. When we looked at the POS treatment and WTP being unchanged, trust increased. However, in this treatment when trust was unchanged, WTP was unchanged. In the NEG treatment, when WTP was unchanged, trust decreased, and when trust was unchanged, WTP decreased. This indicates that the negative information was more influential on WTP than on trust. We also observe in the POSNEG treatment that increased WTP demonstrated increased trust. However, testing this treatment with increased trust shows that WTP was unchanged. This too indicates that a difference may exist in trust and WTP as measures of acceptance. We note that no change in WTP may be expected due to the positive information (recall that when positive information was presented alone and trust was present, WTP did not change), but this comparison was made with a relatively small number of participants that increased their WTP in this treatment.

Conclusion

Our study yielded results similar to those found in previous studies of this and related topics. However, as we further investigated trust as a measure of acceptance and its interaction with WTP and information effects, we were able to identify some interesting results. Generally speaking, information has similar effect on trust and WTP. However, the trust held by, or instilled in, consumers can affect acceptance of the product. Trust and WTP may or may not change as a result of the information presented depending a great deal on the initial trust held and type of information presented. We recognize that the information effect on WTP may be different from that on trust due to the fact the WTP is constrained by consumers' budget. On the other hand, the trust, as an 'unrestricted' measure of acceptance, is expected to be more prone to change due to information input.

Our findings suggest that decision makers, whether producers, government agencies, or consumer groups, cannot rely solely on providing the type of information geared toward their intended result. Some part of the population is likely to not be influenced by the information in the way, or to the degree desired. The effectiveness of information depends on whether positive or negative information is provided. This effect also depends the population's initial perception of the subject of interest. We show that the information effect is most significant when the information presented contradicts the initial assessment of the subject in question. Not surprisingly, when the information is consistent with existing perception, the information effect is shown to be negligible.

However this may vary depending on whether it is trust (as a measure of acceptance) or WTP that is being evaluated.

CHAPTER V

SUMMARY

Information effects on consumer willingness to pay for or accept new or novel products continue to be studied. Of interest is how varying forms of information from varying sources affects consumers' attitudes and perceptions of the product. Previous studies have found that positive information increases consumer confidence in the product as measured by increased WTP or acceptance. Generally, our investigations did not unequivocally find the same results. Negative information has generally been found to decrease acceptance, and our evaluation does observe similar results, whether this information is presented alone or along with positive information.

This thesis focused on irradiated food, a very controversial subject. Being a controversial product, and generically involving food, this study provided a topic that allowed us evaluate information effects that are of interest to many consumers. While the results are not generalizeable to other new or novel products, they do provide insight to how consumers respond to information and how prior beliefs (trust, knowledge) are affected by this information and how WTP is affected.

Recall that in Chapter II, we investigated the effect of information on consumers' WTP for irradiated food. Interestingly, we found that when positive information was presented alone, no increase in WTP was observed as expected, however we did see that the WTP under this treatment was higher than for consumers presented either negative or mixed (positive and negative) information. Two-sided information (positive and

negative) was presented in one treatment, and we evaluated it for an order effect by comparing the WTP results of when positive information was presented first versus when negative information was first presented. Literature on two sided information has identified order effects or increased acceptance when negative information is presented with the positive, however we observed no such effect in our assessment. This may be due to methodological difference or the degree to which the positive and negative information were included in our study. This presents an opportunity to further study mixed information effects in consumer perception by utilizing different balances of positive and negative information and utilizing information from other sources. Prior knowledge and trust were appraised for their ability to mitigate the effects of information on WTP change. We found no mitigating effects for these variables, suggesting that they are not critical in consumer processing of the information presented. Future study is suggested to look into the mechanisms at work behind trust and knowledge to add to the understanding of these personal attributes and their role in information processing.

Cheap talk was the topic of the second paper (Chapter III). Cheap talk is used to describe the inclusion of information regarding hypothetical bias in research of this type. Hypothetical bias is proposed to exist due to consumer's possible inability to accurately assess their WTP for hypothetical products, such as that used in this thesis. Previous studies have resulted in mixed results as to the presence of this bias or the ability of cheap talk to mitigate the effects of it. Many previous articles indicate that this bias in positive in nature, and results in overestimation by consumers, however we failed to identify any significant cheap talk effect. This may be due to a lack of bias in the study,

however cheap talk is a relatively new concept in studies of this type and more study is merited. More study utilizing non-hypothetical scenarios may yield results that could better describe the presence or absence of hypothetical bias.

Our third paper (Chapter IV) revisits the role of trust and WTP, however with in-depth assessment being performed. Utilizing the findings and similar methodologies from chapters II and III, we found that information does affect consumer WTP as expected. Our evaluation of cheap talk showed that this effect was negligible in our study and we did not include differentiation by this variable in our third paper. Similarly, prior knowledge was not overwhelmingly found to be influential on changing consumer WTP and was not included in the third paper. Trust, both pre- and post-information was of interest and significant in the first two chapters, and we further evaluate this factor in the third paper.

Positive information was shown to marginally increase WTP; however we observed that under conditions of consumer trust, it did not increase. It was only when consumers did not initially possess trust in food irradiation was positive information effective in increasing WTP. Opposite, yet similar results were found when negative information was presented. WTP decreased after negative information was presented (alone or with positive) only when there was no initial consumer trust. We observe that the when the valence of the trust is opposite that of the information presented, an information effect is observed. When the signs are equal, information presentation did not have an affect on WTP.

In this third paper, we were also interested in acceptance, as measured by trust. We found that change in trust generally agreed with change in WTP with information presentation; however this was not true in all cases. When WTP was not observed to change and positive information was presented alone, we did observe an increase in trust. Conversely, when WTP was unchanged by negative information (alone or mixed with positive), trust did in fact decrease. This indicates that intrinsic values such as trust held by consumers may be influenced by information even when it is not observed in WTP.

Controversial subjects will continue to be present in society. Information in favor of the subject as well as opposed to it deserves continued study to add to the understanding of how this information works, how consumers' personal beliefs are influenced by the information, and how to best inform the public of new or controversial products.

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APPENDIX A

Positive Information Presented to Participants

General statement about the benefit of food irradiation excerpted from the United States General Accounting Office (GAO)[1], Washington, D.C.

Food irradiation is the process of exposing food to controlled levels of ionizing radiation. Ionizing radiation is a type of energy similar to radio and television waves, microwaves, and infrared radiation. However, the high energy produced by ionizing radiation allows it to penetrate deeply into food, killing microorganisms without significantly raising the food's temperature.

An expert committee convened by the World Health Organization reviewed the findings of over 500 studies and concluded that food irradiation creates no toxicological, microbiological, or nutritional problems. These studies have not borne out concerns about the safety of consuming irradiated foods. For example, the studies indicated that chemical compounds in irradiated food are generally the same as those in cooked foods, and any differences do not put consumers at risk.

Many federal agencies have regulatory responsibilities related to food irradiation, including FDA, USDA, the Nuclear Regulatory Commission (NRC), the Occupational Safety and Health Administration, and the Department of Transportation—with FDA having primary regulatory responsibility for ensuring the safety of irradiated foods.

Irradiation can be used as a pest control treatment on quarantined fruits and vegetables to prevent the importation of harmful pests—such as the Mediterranean fruit fly. To minimize this risk, USDA's Animal and Plant Health Inspection Service's quarantine procedures require the use of fumigation or heat (hot water or hot air) or cold treatment of fruit that is not ripe. Irradiation treatment is an effective alternative for many types of
fresh produce because it can be used on riper fruit and on fruit that cannot tolerate heat treatment. Moreover, a number of past quarantine treatments have recently been prohibited—an example being fumigation with ethylene dibromide.

An important benefit of irradiation is that it can prolong the shelf life of many fruits and vegetables. It does this by reducing spoilage bacteria and mold and inhibiting sprouting and maturation. As a result, products can
be harvested when fully ripened and can be transported and displayed for longer periods while maintaining desirable sensory qualities longer than non-irradiated products.

According to the Institute of Food Technologists, it is highly doubtful that there would ever be any vitamin deficiency resulting from eating irradiated food. In its 1980 evaluation of food irradiation, the Joint Expert Committee convened by FAO, WHO, and IAEA concluded that irradiation caused no special nutritional problems in food.

[1]Under recently passed legislation, the GAO has changed its name from the General Accounting Office to the Government Accountability Office. The Government Accountability Office (GAO) is an agency that works for Congress and the American people. Congress asks GAO to study the programs and expenditures of the federal government.

[2]Spoilage microorganisms, such as certain bacteria, yeast, and mold, cause strong odors and shorten shelf life but are not generally associated with human illness.

The information presented here was excerpted from an August 2000 GAO report which is publicly available through their website. We make no claim favoring or opposing their claims.

APPENDIX B

Negative Information Presented to Participants

General information about consequences of food irradiation excerpted from Public Citizen[1], Washington, D.C.

Food irradiation is sometimes incorrectly compared to microwaving. The energy particles in a gamma ray used in food irradiation are up to 10 billion times more energetic than microwaves, making this a vastly different technology.

Irradiation can lead to the formation of Unique Radiolytic Products (URPs), mysterious chemical compounds that have not been adequately identified or studied for their potential harm to humans. One such type of chemical was recently found to promote the cancer-development process in rats, cause genetic damage in rats, and cause genetic and cellular damage in human and rat cells. This chemical is a radiation byproduct of palmitic acid, a type of fat that occurs in virtually every food.

In legalizing food irradiation, the FDA relied on laboratory research that did not meet modern scientific protocols, which federal laws require.

Very little toxicological testing has been done on irradiated food during the past 20 years.

It is important to note that irradiation will not reduce the amount of fungicides, pesticides and herbicides used during the growing period. The most likely chemical reduction would come from reduced fumigation of fruits and vegetables. Yet, fruits and vegetables are very sensitive to irradiation (they break down easily following irradiation), so it is not a process likely to be used with these foods extensively.

Irradiation kills beneficial microorganisms, such as the yeasts and molds that can help keep botulism at bay, as well as the microorganisms that create the aromas that tell us when food has gone bad.

Irradiation can corrupt the flavor, texture and other physical properties of some foods, leading to meat that smells like a wet dog, onions that turn brown, and eggs that are runny.

Irradiation destroys vitamins, nutrients and essential fatty acids, including up to 80 percent of vitamin A in eggs and half of the beta carotene in orange juice. In some foods, irradiation can intensify the vitamin and nutrient loss caused by cooking, leading to “empty calorie” food.

[1]Public Citizen is a national, nonprofit consumer advocacy organization founded in 1971 to represent consumer interests in Congress, the executive branch and the courts.

The information presented here was excerpted from Public Citizen’s publicly available website. We make no claim favoring or opposing their claims.

APPENDIX C

Information form provided to survey participants

My name is Robert Brummett. I am a graduate student at Texas A&M University. As part of my Masters Thesis research, I am conducting surveys regarding consumer purchases of mangos. This study includes consumer purchasing habits, the presentation of information regarding processes involving mangos, and the perception of issues important to many consumers and industries involved in getting mangos to market.

HEB's has agreed to allow us to conduct these surveys in their stores. Nothing in the subject matter or materials presented in this survey is necessarily representative of HEB's policies, practices, or views as a company. Their association with the survey only extends to their much appreciated willingness to allow these surveys to be conducted in their stores and only with customers willing to participate.

Your participation in this survey is completely voluntary. All responses are anonymous; your identity (name, address, etc.) will not be requested or documented. Your participation is very valuable to our study, so we request that you answer all questions to the best of your ability, but we will also respect your decision if you choose not to respond to any questions that you do not wish to.

Background information

Mangos are a tropical fruit that have been available in the United States for several years, but as they are a tropical fruit, most are imported from other countries where the climate is more suitable to their growth (some are produced in the U.S. – primarily Hawaii).

One issue associated with importing tropical fruit is preventing non-native insects, that may be in the fruit shipments (such as fruit flies), from entering the U.S. These pests could harm crops or plants grown here. Typically, mangos are treated in a manner such that they must be picked at a point in their growth where they are not fully ripened. This is to allow them to tolerate the treatment processes with little damage and to extend the amount of time they can be displayed in the store. Our study looks at an alternative process and your perceptions of this process and how it would affect your purchasing habits.

General Survey Information

You may or may not already be familiar with mangos. Again, mangos are a tropical fruit that are primarily imported. Other tropical fruits that are primarily imported include bananas, kiwi fruit, and papayas. You will be asked about your purchasing habits of mangos, but it is ok if you haven't purchased them in the past. The first few questions will deal with you purchase habits of mangos. After those, if you are not familiar with mangos, we just ask that you complete the survey while thinking of how you respond to the questions if you were purchasing mangos.

To maintain an unbiased study, I am not allowed to answer questions about the study beyond what is presented here. I can answer general questions about completing the survey form, but not about your choices or questions regarding the material presented during the survey.

The survey will take approximately 20 minutes and you will receive a store coupon as our way of saying thank you for your participation. Please accept the coupon even if you choose not to complete the survey at any point.

If you have any questions after the survey, please feel free to contact me at the address or phone number at the bottom of this page.

APPENDIX D

Example Survey Form (Includes Cheap Talk)

Judge

O PO O PN
O NO O NP

Mango Study

Date / /

Talk

Time : O AM O PM

Store

1. **Are you the primary grocery shopper for your household?** ***(Your household includes yourself, your dependent(s), and persons with whom you share income and living expenses)***

   O Yes O No

2. **How often do you shop for groceries?**
   - O Daily
   - O Between 2-5 times a week
   - O Once a week
   - O Every 2 weeks
   - O Once a month

3. **When you grocery shop, do you sometimes purchase mangos?**

   O Yes O No -> Go to Q6

4. **On average, how many mangos do you purchase each trip?**
   - O 1
   - O 2-5
   - O 6 or more

5. **How long do you keep mangos after purchase before eating them?**
   - O 1 day
   - O 2-4 days
   - O 5 or more days

6. **Do store displays help you to decide whether or not to purchase mangos or other fresh fruit or vegetables?**

   O Yes O No

7. **Using a scale of 1 to 10 where 1 means little and 10 mean a great deal, how much do you think each of the following factors contributes to a low shelf life of fresh mangos?** ***(shelf life is the amount of time before the fruit spoils or "goes bad")***

	Little ← → Great Deal									
	O 1	O 2	O 3	O 4	O 5	O 6	O 7	O 8	O 9	O 10
a. Improper Refrigeration										
b. Presence of Bacteria, Mold, or other Microorganisms	O 1	O 2	O 3	O 4	O 5	O 6	O 7	O 8	O 9	O 10
c. Improper Handling	O 1	O 2	O 3	O 4	O 5	O 6	O 7	O 8	O 9	O 10
d. Ripeness when Purchased	O 1	O 2	O 3	O 4	O 5	O 6	O 7	O 8	O 9	O 10
e. Country where Grown	O 1	O 2	O 3	O 4	O 5	O 6	O 7	O 8	O 9	O 10

8. **Have you heard of food irradiation?**

   O Yes O No

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Judge

9. How would you rate your knowledge of food irradiation?

- O I am sufficiently informed about the irradiation process
- O I am somewhat informed about the irradiation process but do not feel comfortable enough to make an accurate assessment
- O I have heard about the irradiation process but I do not know anything about it
- O I have no knowledge of food irradiation

10. Some people hear about food irradiation and feel comfortable with it, while others feel uncomfortable. In which group do you think you belong?

O Very Comfortable
O Somewhat Comfortable
O Neutral
O Somewhat Uncomfortable
O Very Uncomfortable

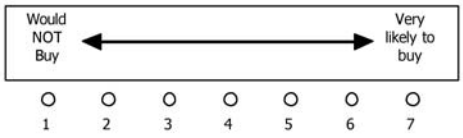
11. This symbol is called "radura". It is used on irradiated food. How would you interpret this food irradiation symbol as a label on mangos?

- O I consider it an assurance of safety and quality and would be more inclined to buy the product
- O I consider it a warning and would avoid the product
- O It would not affect my buying decision
- O I don't know

12. How important to you is it that irradiated food be labeled as such?

O Unimportant
O Somewhat Unimportant
O Neutral
O Somewhat Important
O Very Important

13. On a scale of 1 to 7 where 1 means you would NOT buy irradiated mangos and 7 means it is very likely that you would buy them, how likely would it be that you would purchase mangos if they were irradiated?



14. If you answered 1 to the previous question (Would NOT buy), which of the following is the most important reasons you would not buy irradiated mangos? (Go to question 15 if your response was not 1 on the previous question)

O Irradiation is harmful and may lead to health complications
O I am satisfied with mangos now and see no need for irradiation
O Not sure whether the irradiation process is safe
O Other (please specify) _____

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Judge

15. Previous studies indicate that, individuals in general respond to surveys in a different way than they act in the real life. It is quite common to find that individuals say they are willing to pay higher prices than those that they are really willing to pay. We believe that this is due to the difficulty to calculate the exact impact of these higher expenses on the household economy. It is easy to be generous when in reality one does not need to pay more in the shop. I would then like to remind you that it is perfectly fine if you are not willing to pay any premium, given that paying extra for these irradiated mangoes will leave you with less disposable income for other products or savings.

The average price for mangos in the past year was $0.50 each.

How much more for each irradiated mango than this would you be willing to pay?
(please bubble in your response)

O $0.00	O $0.05	O $0.15	O $0.40
O $0.01	O $0.06	O $0.20	O $0.50
O $0.02	O $0.08	O $0.25	O more than $0.50
O $0.03	O $0.10	O $0.30	
O $0.04	O $0.12	O $0.35	

16. If you answered $0.00 to the previous question, what is the most important reason you would not pay more? (Go to question 17 if response was not $0.00)

O The current price is all I am going to pay
O I am satisfied with mangos now and don't feel I'd be more satisfied
O The government should pay the cost of irradiation
O I would not buy irradiated mangos
O Other (please specify) _____

17. The average price for mangos in the past year was $0.50 each.
Would you be willing to buy irradiated mangos if they were available at a lower price than this average price?

O Yes O No

The questions below are intended to help us understand how you feel about irradiated food products, in particular, the trust you have of them.

18. Would you trust irradiated food products?

O Yes O No -> Go to Q20

19. What is the main reason you would trust them?

O My personal feelings (gut instinct) tells me these products can be trusted
O I trust the government to make sure these products can be trusted
O I have heard of them from friends
O I have tried irradiated products before
O Other (please specify) _____

20. How would you describe your thoughts about the risks to your health from eating irradiated foods?

O I do not believe there would be health risks
O I believe there would only be future ill health risks
O I believe there would be both future and immediate health risks
O Other (please specify) _____

Judge

Please answer the following questions now that you have read the information provided regarding irradiation of food.

21. Which group of people regarding irradiated foods do you think you belong?

- O Very Comfortable
- O Somewhat Comfortable
- O Neutral
- O Somewhat Uncomfortable
- O Very Uncomfortable

22. Recall the radura.
How would you now interpret this food irradiation symbol as a label on mangos?

- O I consider it an assurance of safety and quality and would be more inclined to buy the product
- O I consider it a warning and would avoid the product
- O It would not affect my buying decision
- O I don't know

23. How important is labeling irradiated food to you?

- O Unimportant
- O Somewhat Unimportant
- O Neutral
- O Somewhat Important
- O Very Important

24. On a scale of 1 to 7 where 1 means you would NOT buy irradiated mangos and 7 means it is very likely that you would buy them, how likely would it be that you would purchase mangos if they were irradiated?

Would NOT Buy ← → Very likely to buy

O 1 O 2 O 3 O 4 O 5 O 6 O 7

25. If you answered 1 to the previous question (Would NOT buy), which of the following is the most important reasons you would NOT buy irradiated mangos?
(Go to question 26 if your response was not 1 on the previous question)

- O Irradiation is harmful and may lead to health complications
- O I am satisfied with mangos now and see no need for irradiation
- O Not sure whether the irradiation process is safe
- O Other (please specify) _____

Judge

26. Previous studies indicate that, individuals in general respond to surveys in a different way than they act in the real life. It is quite common to find that individuals say they are willing to pay higher prices than those that they are really willing to pay. We believe that this is due to the difficulty to calculate the exact impact of these higher expenses on the household economy. It is easy to be generous when in reality one does not need to pay more in the shop. I would then like to remind you that it is perfectly fine if you are not willing to pay any premium, given that paying extra for these irradiated mangoes will leave you with less disposable income for other products or savings.

The average price for mangos in the past year was $0.50 each.

How much more for each irradiated mango than this would you be willing to pay?
(please bubble in your response)

O $0.00	O $0.05	O $0.15	O $0.40
O $0.01	O $0.06	O $0.20	O $0.50
O $0.02	O $0.08	O $0.25	O more than $0.50
O $0.03	O $0.10	O $0.30	
O $0.04	O $0.12	O $0.35	

27. If you answered $0.00 to the previous question, what is the most important reason you would not pay more? (Go to question 28 if response was not $0.00)

O The current price is all I am going to pay
O I am satisfied with mangos now and don't feel I'd be more satisfied
O The government should pay the cost of irradiation
O I would not buy irradiated mangos
O Other (please specify) _____

28. The average price for mangos in the past year was $0.50 each? Would you be willing to buy irradiated mangos if they were available at a lower price than this average price?

O Yes O No

29. Would you trust irradiated food products?

O Yes O No -> Go to Q31

30. What is the main reason you would trust them?

O My personal feelings (gut instinct) tells me these products can be trusted
O I trust the government to make sure these products can be trusted
O I have heard of them from friends
O I have tried irradiated products before
O Other (please specify) _____

31. How would you describe your thoughts about the risks to your health from eating irradiated foods?

O I do not believe there would be health risks
O I believe there would only be future ill health risks
O I believe there would be both future and immediate health risks
O Other (please specify) _____

32. Which of these sources would you rely on the most for information regarding irradiated food?

O Government Agencies O Consumer Advocacy Groups

Judge

The following questions are about you, but do not reveal your identity in this survey. Response is requested to assist in comparing this survey to national demographics.

33. Your age

Years

34. Your Gender

- O Male
- O Female

35. What race or ethnical group do you consider yourself to be a member of?

- O White (Caucasian)
- O African American
- O Hispanic
- O Asian or Pacific Islander
- O Other (please specify): _____
- O Prefer not to say

36. What is your marital status?

- O Married
- O Separated/Divorced
- O Single
- O Widowed
- O Engaged
- O Prefer not to say

37. What is the highest level of education that you have completed?

- O Some school
- O High School
- O Some College
- O College graduate
- O Advanced degree (Master's or Ph.D.)
- O Prefer not to say

38. What is your employment status?

- O Full Time
- O Part Time
- O Retired
- O Disabled
- O Unemployed
- O Prefer not to say

39. What was your total household income for the last year before taxes?

- O Under $15,000
- O $15,000 - $29,999
- O $30,000 - $49,999
- O $50,000 - $74,999
- O $75,000 - $99,999
- O $100,000 or greater
- O Prefer not to say

40. How would you describe the area you live in?

- O City
- O Suburban
- O Rural

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APPENDIX E

IRB Approval

Office of the Vice President for Research
Office of Research Compliance - Institutional Review Board
1186 TAMU, College Station, TX 77843-1186
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979.458.4067 Office 979.862.3176 Fax

Dr. J. Steven Moore, Chair
Dr. Alvin Larke, Jr., Chair
Ms. Sharon Alderete, Program Coordinator

December 19, 2005

MEMORANDUM

TO: Robert George Brummett
Agricultural Economics MS 3369

FROM: Ms. Sharon Alderete, CIP
IRB Program Coordinator

SUBJECT: IRB Request for Exemption

PROTOCOL NUMBER: 2005-0624

TITLE: Consumer Acceptance of Irradiated Mangos: The Effects of Information on Attitudes and Perceptions

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The Institutional Review Board (IRB) has determined that the referenced protocol application meets the criteria for exemption and no further review is required. However, any amendment or modification to the protocol must be reported to the IRB and reviewed before being implemented to ensure the protocol still meets the criteria for exemption.

This determination was based on the following Code of Federal Regulations:
(http://www.hhs.gov/ohrp/humansubjects/guidance/45cfr46.htm)

45 CFR 46.101(b)(2) - Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior, unless: (a) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (b) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

If you have any questions regarding this protocol application or the review process, please contact the IRB Office at (979)458-4067.

VITA

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